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# **AN INVESTIGATION OF THEORIES OF FOCUSING**

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**SUBMITTED FOR THE QUALIFICATION OF DOCTOR OF PHILOSOPHY**

**DEPARTMENT OF PSYCHOLOGY, UNIVERSITY OF DURHAM**

**2001**

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## **ABSTRACT**

This thesis investigates the proposals of a number of psychological and computational accounts of focusing and pronoun interpretation in view of obtaining experimental evidence for the questions raised by the accounts. Four distinct but related studies were conducted with the aim of bringing together various frameworks as a step towards developing an integrated model of the processes of comprehension.

Experiments 1-3 in Chapter 2 show that thematic role and surface position focusing take precedence over the salience from naming, but that naming effects are seen in the absence of thematic role focusing. Experiments 4-5 in Chapter 3 show the effect of clause subordination in certain complex sentences, with main clauses being more prominent than subordinate ones. Experiments 6-8 in Chapter 3 show that this effect may not be generalised to different types of complex sentences, however. Experiments 9-18 in Chapter 4 show that animacy has a strong effect on prominence, overriding thematic role and surface position effects. The presence of these latter two effects is crucially dependent on the pattern of animacy. Experiments 19-21 in Chapter 5 show the effects of grammatical parallelism, in which the features of both the anaphor and the antecedent have an influence, which overlays structural focusing.

These results show that a variety of constraints can complete in determining the accessibility of discourse referents. The structural, semantic, and pragmatic discourse context in which referents are introduced and the attributes of the cue used to re-access them have a role. The findings are discussed in terms of an activation-based framework, whereby pronoun resolution is determined by the relative activation of the potential antecedents in the mental representation of the discourse. They suggest a dynamic model of focusing in which an antecedent's features establish and update the focus, and in which certain linguistic elements may trigger the current focus to be modified.

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# TABLE OF CONTENTS

AN INVESTIGATION OF THEORIES OF FOCUSING .....	1
ABSTRACT .....	2
ACKNOWLEDGEMENTS .....	3
TABLE OF CONTENTS .....	4
FIGURES .....	8
TABLES .....	9
DECLARATION .....	12
STATEMENT OF COPYRIGHT .....	12
WORK FOR THIS THESIS HAS RESULTED IN THE FOLLOWING	
CONFERENCE ABSTRACTS: .....	13
CHAPTER 1 – INTRODUCTION .....	14
CHAPTER 2 – EXPERIMENTS 1-3.....	23
INTRODUCTION.....	24
THEMATIC ROLE FOCUSING.....	24
NAMES AND DESCRIPTIONS .....	27
SURFACE POSITION .....	29
EXPERIMENT 1.....	32
METHOD.....	33
<i>Participants</i> .....	33
<i>Materials and Design</i> .....	33
<i>Procedure</i> .....	36
RESULTS AND DISCUSSION .....	36
EXPERIMENT 2.....	39
METHOD.....	39
<i>Participants</i> .....	39
<i>Design, Materials and Procedure</i> .....	40
RESULTS AND DISCUSSION .....	40
EXPERIMENT 3.....	42
METHOD.....	43
<i>Participants</i> .....	43
<i>Materials</i> .....	43
<i>Design and Procedure</i> .....	44
RESULTS AND DISCUSSION .....	45
<i>Post-Hoc Items Analysis</i> .....	47

<b>GENERAL DISCUSSION.....</b>	<b>50</b>
<b>CHAPTER 3 – EXPERIMENTS 4-8.....</b>	<b>57</b>
<b>INTRODUCTION.....</b>	<b>58</b>
COMPUTATIONAL RESEARCH .....	59
PSYCHOLINGUISTIC STUDIES .....	66
<b>EXPERIMENT 4.....</b>	<b>74</b>
METHOD.....	74
<i>Participants</i> .....	74
<i>Materials</i> .....	75
<i>Design</i> .....	76
<i>Procedure</i> .....	77
RESULTS AND DISCUSSION .....	78
<b>EXPERIMENT 5.....</b>	<b>79</b>
METHOD.....	80
<i>Participants</i> .....	80
<i>Materials</i> .....	80
<i>Design and Procedure</i> .....	81
RESULTS AND DISCUSSION .....	81
<b>EXPERIMENT 6.....</b>	<b>83</b>
METHOD.....	84
<i>Participants</i> .....	84
<i>Materials</i> .....	84
<i>Design</i> .....	86
<i>Procedure</i> .....	86
RESULTS AND DISCUSSION .....	86
<b>EXPERIMENT 7.....</b>	<b>89</b>
METHOD.....	91
<i>Participants</i> .....	91
<i>Materials</i> .....	91
<i>Design</i> .....	93
<i>Procedure</i> .....	93
RESULTS AND DISCUSSION .....	93
<b>EXPERIMENT 8.....</b>	<b>97</b>
METHOD.....	98
<i>Participants</i> .....	98
<i>Materials</i> .....	98
<i>Design</i> .....	100

<i>Procedure</i> .....	101
RESULTS AND DISCUSSION .....	101
<b>GENERAL DISCUSSION</b> .....	<b>103</b>
<b>CHAPTER 4 – EXPERIMENTS 9-18</b> .....	<b>110</b>
<b>INTRODUCTION</b> .....	<b>111</b>
DISCOURSE FOCUS AND ACTOR FOCUS .....	112
THEMATIC ROLE FOCUSING.....	115
ANIMACY .....	117
STRUCTURAL FOCUSING .....	121
<b>EXPERIMENTS 9-11: ONE ANIMATE REFERENT</b> .....	<b>126</b>
METHOD.....	128
<i>Participants</i> .....	128
<i>Materials and Design</i> .....	129
<i>Procedure</i> .....	130
RESULTS AND DISCUSSION .....	131
<b>EXPERIMENTS 12-13: TWO ANIMATE REFERENTS</b> .....	<b>135</b>
RESULTS AND DISCUSSION .....	135
<b>EXPERIMENTS 14-15: ALL ANIMATE OR INANIMATE REFERENTS</b> .....	<b>139</b>
RESULTS AND DISCUSSION .....	139
<b>EXPERIMENTS 16-18: ONE ANIMATE REFERENT, FOLLOWED BY THE</b>	
<b>PRONOUN ‘IT’</b> .....	<b>143</b>
METHOD.....	144
<i>Materials and Design</i> .....	144
RESULTS AND DISCUSSION .....	144
FURTHER ANALYSIS.....	147
<b>GENERAL DISCUSSION</b> .....	<b>149</b>
<b>CHAPTER 5 – EXPERIMENTS 19-21</b> .....	<b>158</b>
<b>INTRODUCTION</b> .....	<b>159</b>
CENTERING THEORY .....	160
PARALLELISM .....	164
SURI AND MCCOY’S CURRENT FOCUS AND SUBJECT FOCUS.....	169
KAMEYAMA’S PROPERTY-SHARING CONSTRAINT .....	171
PASSIVE VOICE .....	177
<b>EXPERIMENTS 19A AND 19B</b> .....	<b>181</b>
METHOD.....	182
<i>Participants</i> .....	182
<i>Materials and Design</i> .....	182

<i>Procedure</i> .....	185
RESULTS AND DISCUSSION .....	186
<b>EXPERIMENTS 20A AND 20B .....</b>	<b>190</b>
METHOD .....	191
<i>Participants</i> .....	191
<i>Materials</i> .....	191
<i>Design</i> .....	192
PROCEDURE .....	192
RESULTS AND DISCUSSION .....	194
<b>EXPERIMENTS 21A AND 21B .....</b>	<b>202</b>
METHOD .....	202
<i>Participants</i> .....	202
<i>Materials and Design</i> .....	202
<i>Procedure</i> .....	203
RESULTS AND DISCUSSION .....	203
<b>GENERAL DISCUSSION.....</b>	<b>207</b>
<b>CHAPTER 6– CONCLUDING REMARKS .....</b>	<b>216</b>
<b>APPENDIX A: EXPERIMENTAL MATERIALS .....</b>	<b>230</b>
MATERIALS USED IN EXPERIMENT 1 .....	231
MATERIALS USED IN EXPERIMENT 3 .....	236
MATERIALS USED IN EXPERIMENT 4 .....	238
MATERIALS USED IN EXPERIMENT 5 .....	241
MATERIALS USED IN EXPERIMENT 6 .....	243
MATERIALS USED IN EXPERIMENT 7 .....	250
MATERIALS USED IN EXPERIMENT 8 .....	254
MATERIALS USED IN EXPERIMENT 9 .....	263
MATERIALS USED IN EXPERIMENT 10 .....	264
MATERIALS USED IN EXPERIMENT 11 .....	265
MATERIALS USED IN EXPERIMENT 12 .....	267
MATERIALS USED IN EXPERIMENT 13 .....	268
MATERIALS USED IN EXPERIMENT 14 .....	270
MATERIALS USED IN EXPERIMENT 15 .....	271
MATERIALS USED IN EXPERIMENTS 19A AND 19B.....	273
MATERIALS USED IN EXPERIMENTS 20A AND 20B.....	277
MATERIALS USED IN EXPERIMENTS 21A AND 21B.....	281
<b>APPENDIX B: STATISTICAL TABLES.....</b>	<b>286</b>
<b>REFERENCES.....</b>	<b>305</b>

## TABLE OF FIGURES

<i>Figure 1: Mean First Mention Scores in the critical sentence.....</i>	<i>37</i>
<i>Figure 2: Mean First Mention Scores in the critical sentence.....</i>	<i>41</i>
<i>Figure 3: Mean First Mention Scores in the critical sentence.....</i>	<i>45</i>
<i>Figure 4: Mean First Mention Scores for the items containing a main clause as the second conjoined clause.....</i>	<i>48</i>
<i>Figure 5: Mean First Mention Scores for the items containing a subordinate clause as the second conjoined clause.....</i>	<i>49</i>
<i>Figure 6: Mean reading times for the target sentences .....</i>	<i>78</i>
<i>Figure 7: Mean reading times for the target sentences .....</i>	<i>82</i>
<i>Figure 8: Mean reading times for the target sentences .....</i>	<i>87</i>
<i>Figure 9: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>132</i>
<i>Figure 10: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>132</i>
<i>Figure 11: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>133</i>
<i>Figure 12: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>136</i>
<i>Figure 13: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>136</i>
<i>Figure 14: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>137</i>
<i>Figure 15: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>140</i>
<i>Figure 16: Mean number of times each referent appeared as initial subject in continuations.....</i>	<i>140</i>
<i>Figure 17: Mean number of times each referent was the referent of the pronoun .....</i>	<i>145</i>
<i>Figure 18: Mean number of times each referent was the referent of the pronoun .....</i>	<i>145</i>
<i>Figure 19: Mean number of times each referent was the referent of the pronoun .....</i>	<i>145</i>
<i>Figure 20: Mean reading times for the target sentences in the active condition (Experiment 19a).....</i>	<i>186</i>
<i>Figure 21: Mean reading times for the target sentences in the passive condition (Experiment 19a).....</i>	<i>188</i>

<i>Figure 22: Mean reading times for the target sentences in the active condition (Experiment 20a).....</i>	<i>195</i>
<i>Figure 23: Mean reading times for the target sentences in the passive condition (Experiment 20b).....</i>	<i>196</i>
<i>Figure 24: Mean reading times for the target sentences in the active condition (Experiment 21a).....</i>	<i>204</i>
<i>Figure 25: Mean reading times for the target sentences in the passive condition (Experiment 21b).....</i>	<i>205</i>

## TABLE OF TABLES

<i>Table 1: Example of materials used in Experiment 1 .....</i>	<i>35</i>
<i>Table 2: Example of materials used in Experiment 3 .....</i>	<i>44</i>
<i>Table 3: Example of materials used in Experiment 4 .....</i>	<i>75</i>
<i>Table 4: Example of materials used in Experiment 5 .....</i>	<i>81</i>
<i>Table 5: Example of materials used in Experiment 6, containing a because sentence with the SE version.....</i>	<i>85</i>
<i>Table 6: Example of materials used in Experiment 6, containing a because sentence with the ES version.....</i>	<i>85</i>
<i>Table 7: Example of materials used in Experiment 7, containing a because sentence with the SE version, where the Stimulus is the subject of the main clause .....</i>	<i>92</i>
<i>Table 8: Example of materials used in Experiment 7, containing a because sentence with the ES version, where the Experiencer is the subject of the main clause.....</i>	<i>92</i>
<i>Table 9: Example of materials used in Experiment 7, containing a because sentence where the main clause exhibits no implicit causality.....</i>	<i>92</i>
<i>Table 10: Mean scores for the first and the second antecedent in the critical sentence and the Difference Scores .....</i>	<i>94</i>
<i>Table 11: Example of materials used in Experiment 8, containing a because sentence with the S-E version, where the Stimulus is the subject of the main clause .....</i>	<i>99</i>
<i>Table 12: Example of materials used in Experiment 8, containing a because sentence with the E-S version, where the Experiencer is the subject of the main clause .....</i>	<i>99</i>
<i>Table 13: Mean reading times for the target sentences .....</i>	<i>101</i>
<i>Table 14: Examples of the materials used in Experiments 9-15 .....</i>	<i>130</i>
<i>Table 15: Example of materials used in the active version (Experiment 19a).....</i>	<i>183</i>
<i>Table 16: Example of materials used in the passive version (Experiment 19b) .....</i>	<i>183</i>
<i>Table 17: Example of materials used in the active version (Experiment 20a).....</i>	<i>192</i>

<i>Table 18: Example of materials used in the passive version (Experiment 20b) .....</i>	<i>192</i>
<i>Table 19: Percentage of texts judged acceptable in the active version (Experiment 20a)</i>	<i>197</i>
<i>Table 20: Percentage of texts judged acceptable in the passive version (Experiment 20b)</i>	<i>198</i>
<i>Table 21: Summary for the ANOVAs in Experiment 1 across participants .....</i>	<i>287</i>
<i>Table 22: Summary for the ANOVAs in Experiment 1 across items .....</i>	<i>287</i>
<i>Table 23: Summary for the ANOVAs in Experiment 2 across participants .....</i>	<i>287</i>
<i>Table 24: Summary for the ANOVAs in Experiment 2 across items .....</i>	<i>287</i>
<i>Table 25: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across participants .....</i>	<i>287</i>
<i>Table 26: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across items ...</i>	<i>288</i>
<i>Table 27: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across items with the main-main structure .....</i>	<i>288</i>
<i>Table 28: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across items with the main-subordinate structure .....</i>	<i>289</i>
<i>Table 29: Summary for the ANOVAs in Experiment 4 across participants .....</i>	<i>289</i>
<i>Table 30: Summary for the ANOVAs in Experiment 4 across items .....</i>	<i>289</i>
<i>Table 31: Summary for the ANOVAs in Experiment 5 across participants .....</i>	<i>289</i>
<i>Table 32: Summary for the ANOVAs in Experiment 5 across items .....</i>	<i>289</i>
<i>Table 33: Summary for the ANOVAs in Experiment 6 across participants .....</i>	<i>289</i>
<i>Table 34: Summary for the ANOVAs in Experiment 6 across items .....</i>	<i>289</i>
<i>Table 35: Summary for the Wilcoxon's rank-sum tests in Experiment 7 across participants .....</i>	<i>290</i>
<i>Table 36: Summary for the Wilcoxon's rank-sum tests in Experiment 7 across items ...</i>	<i>290</i>
<i>Table 37: Summary for the ANOVAs in Experiment 7 across participants .....</i>	<i>291</i>
<i>Table 38: Summary for the ANOVAs in Experiment 7 across items .....</i>	<i>291</i>
<i>Table 39: Plausibility pretest results for correct version of the texts in Experiment 8...</i>	<i>291</i>
<i>Table 40: Plausibility pretest results for incorrect version of the texts in Experiment 8</i>	<i>291</i>
<i>Table 41: Summary for the ANOVAs in Experiment 8 across participants .....</i>	<i>292</i>
<i>Table 42: Summary for the ANOVAs in Experiment 8 across items .....</i>	<i>292</i>
<i>Table 43: Summary for the t-tests in Experiment 9 across participants .....</i>	<i>292</i>
<i>Table 44: Summary for the t-tests in Experiment 9 across items .....</i>	<i>292</i>
<i>Table 45: Summary for the t-tests in Experiment 10 across participants .....</i>	<i>293</i>
<i>Table 46: Summary for the t-tests in Experiment 10 across items .....</i>	<i>293</i>
<i>Table 47: Summary for the t-tests in Experiment 11 across participants .....</i>	<i>293</i>
<i>Table 48: Summary for the t-tests in Experiment 11 across items .....</i>	<i>293</i>

<i>Table 49: Summary for the t-tests in Experiment 12 across participants .....</i>	<i>294</i>
<i>Table 50: Summary for the t-tests in Experiment 12 across items.....</i>	<i>294</i>
<i>Table 51: Summary for the t-tests in Experiment 13 across participants .....</i>	<i>294</i>
<i>Table 52: Summary for the t-tests in Experiment 13 across items.....</i>	<i>294</i>
<i>Table 53: Summary for the t-tests in Experiment 14 across participants .....</i>	<i>295</i>
<i>Table 54: Summary for the t-tests in Experiment 14 across items.....</i>	<i>295</i>
<i>Table 55: Summary for the t-tests in Experiment 15 across participants .....</i>	<i>295</i>
<i>Table 56: Summary for the t-tests in Experiment 15 across items.....</i>	<i>295</i>
<i>Table 57: Summary for the t-tests in Experiment 16 across participants .....</i>	<i>296</i>
<i>Table 58: Summary for the t-tests in Experiment 16 across items.....</i>	<i>296</i>
<i>Table 59: Summary for the t-tests in Experiment 17 across participants .....</i>	<i>296</i>
<i>Table 60: Summary for the t-tests in Experiment 17 across items.....</i>	<i>296</i>
<i>Table 61: Summary for the t-tests in Experiment 18 across participants .....</i>	<i>297</i>
<i>Table 62: Summary for the t-tests in Experiment 18 across items.....</i>	<i>297</i>
<i>Table 63: Summary for the ANOVAs in Experiment 19a across participants .....</i>	<i>297</i>
<i>Table 64: Summary for the ANOVAs in Experiment 19a across items.....</i>	<i>297</i>
<i>Table 65: Summary for the ANOVAs in Experiment 19b across participants .....</i>	<i>298</i>
<i>Table 66: Summary for the ANOVAs in Experiment 19b across items.....</i>	<i>298</i>
<i>Table 67: Summary for the ANOVAs on reading times in Experiment 20a across participants .....</i>	<i>299</i>
<i>Table 68: Summary for the ANOVAs on reading times in Experiment 20a across items.....</i>	<i>299</i>
<i>Table 69: Summary for the ANOVAs on reading times in Experiment 20b across participants .....</i>	<i>300</i>
<i>Table 70: Summary for the ANOVAs on reading times in Experiment 20b across items.....</i>	<i>300</i>
<i>Table 71: Summary for the ANOVAs on acceptability judgements in Experiment 20a across participants.....</i>	<i>301</i>
<i>Table 72: Summary for the ANOVAs on acceptability judgements in Experiment 20a across items.....</i>	<i>301</i>
<i>Table 73: Summary for the ANOVAs on acceptability judgements in Experiment 20b across participants.....</i>	<i>302</i>
<i>Table 74: Summary for the ANOVAs on acceptability judgements in Experiment 20b across items.....</i>	<i>302</i>
<i>Table 75: Summary for the ANOVAs in Experiment 21a across participants .....</i>	<i>303</i>
<i>Table 76: Summary for the ANOVAs in Experiment 21a across items.....</i>	<i>303</i>
<i>Table 77: Summary for the ANOVAs in Experiment 21b across participants .....</i>	<i>304</i>
<i>Table 78: Summary for the ANOVAs in Experiment 21b across items.....</i>	<i>304</i>



## **DECLARATION**

The research contained in this thesis was carried out by the author whilst as a postgraduate student in the Department of Psychology, University of Durham. For a period of this time, the author was also employed as a part-time Research Associate at the Human Communication Research Centre, University of Edinburgh on the project *Focusing and the relationship between events in discourse*. This project provided direction for topics covered by this thesis, but the experiments and their interpretation were carried out solely by the author. None of the work contained in this thesis has been submitted in candidature for any other degree.

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**WORK FOR THIS THESIS HAS RESULTED IN THE  
FOLLOWING CONFERENCE ABSTRACTS:**

Pearson, J., Henschel, R., & Stevenson, R.J. (2000). Centering and parallelism in pronoun resolution: Inanimate referents and sentence structure. In *Proceedings of the 13th annual CUNY Human Sentence Processing Conference*, La Jolla, CA.

Pearson, J., Stevenson, R.J., & Poesio, M. (1999). Thematic role focusing, name focusing and the comprehension of pronouns. In *Proceedings of the 5th annual Architectures and Mechanisms of Language Processing Conference*, Edinburgh, Scotland.

Pearson, J., Stevenson, R.J., & Poesio, M. (2000). Pronoun resolution in complex sentences. In *Proceedings of the 6th annual Architectures and Mechanisms of Language Processing Conference*, Leiden, The Netherlands.

Pearson, J., Stevenson, R.J., & Poesio, M. (2001a). The effects of animacy, thematic role and surface position on the focusing of entities in discourse. In *Proceedings of the 1st Cognitively Plausible Models of Semantic Processing Workshop*, Edinburgh, Scotland.

Pearson, J., Stevenson, R.J., & Poesio, M. (2001b). Focusing in complex sentences. In *Proceedings of the 18th Annual Conference of the British Psychological Society Cognitive Psychology Section and the 12th Conference of the European Society for Cognitive Psychology*, Edinburgh, Scotland.

## CHAPTER 1 – INTRODUCTION

The goal of this thesis is to critically examine some of the claims from various psychological and computational accounts of focusing and pronoun interpretation and obtain psychological evidence for the questions raised. This thesis investigates the accessibility of discourse referents as a function of certain discourse factors. My aim is to determine the relative contributions of various factors and how they might combine when present together in a discourse. I bring together various accounts as a step towards developing an integrated model of the processes of comprehension.

When reading a text, a goal of a comprehender is to integrate new information with that encountered previously. There are a variety of linguistic features present in the discourse that may assist comprehension by relating the current information back to what is already known. Anaphoric reference is an important means by which previous information may be referred back to. Frequently used anaphors are pronouns. Pronouns may make a text more readable in certain instances where the repetition of a referent using the same full form appears intuitively clumsy. Pronouns, however, are frequently ambiguous, having more than one potential antecedent. They contain little information to constrain their interpretation. Nonetheless, they are frequently resolved without apparent effort or difficulty.

Currently receiving much attention is how the comprehender's attention may be focused onto certain elements and not others, thus reducing the inferences required in order to resolve a pronoun. Theories that take this view are known as focusing theories because the prominent referents are said to be in the focus of attention, whereas non-prominent referents are not focused. Focusing theories propose that the elements in the comprehender's discourse representation vary in

their prominence, with some entities being more prominent others. According to focusing theories, the most focused referent is more accessible in the mind of the comprehender. The focus on this referent means that it is the most accessible to a subsequent pronoun and likely to be mentioned next because of its central role in the representation.

The central notion of focusing theories is that they propose that information in the discourse can direct the focus of attention onto certain discourse referents. However, there is disagreement between researchers as to what aspects of the discourse are significant in governing the mechanisms involved in determining prominence. Also, some researchers suggest that certain factors present in the discourse can take precedence over others in determining the focus whereas others suggest that they may conspire and compete. A range of discourse factors have been claimed to be associated with making a referent prominent. These involve syntactic, semantic and pragmatic features. The experiments reported here investigate a variety of factors, as suggested by the consideration of a number of theories of focus, in order to investigate these theories.

In the remainder of Chapter 1, I will briefly outline the theories investigated by this thesis and introduce some of the concepts involved. A discussion of more specific details is deferred until the relevant chapter associated with the particular question at hand. In the four experimental chapters that follow (Chapters 2-5), I will discuss these specific theories in greater detail, with an assessment of the theory in light of other relevant psycholinguistic research. The experiments reported in each chapter are the outcome of an attempt to bridge certain gaps in our knowledge about the focus and its role in pronoun interpretation, as suggested

by the consideration of the accounts discussed and the evidence for them. The experiments are followed by a discussion of the results from each experiment, relating them to previous research. Finally, in Chapter 6, the results will be outlined and the findings discussed. It is concluded that structural, semantic and pragmatic factors affect the accessibility of referents in a discourse model, but that linguistic features, such as the cue used to re-access an antecedent, may modify this. The focused entity is a function of the precise range of factors present. Factors both conspire and compete, depending on the factors present.

Chapter 2 reports three experiments investigating the roles of thematic role, naming and surface position. This study was designed to compare accounts of focusing proposed by Stevenson, Crawley and Kleinman (1994) and by Sanford, Moar and Garrod (1988).

Stevenson et al investigated the effects of thematic role focusing. According to their account, thematic role preferences govern which referent is likely to be mentioned next. The preferred thematic role in state sentences, which contain referents occupying Stimulus and Experiencer roles, with a full stop or the connective *because* was found to be the Stimulus. Thus, the pronoun following a state sentence (1) is typically interpreted as referring to the Stimulus referent.

(1)                    John liked Bill. He...

Stevenson, Knott, Oberlander and McDonald (2000) suggest that this effect is due to the connective signalling the coherence relation between the two clauses. They argue that *because* or a full stop signals an Explanation relation and hence it is likely that a completion will be an explanation of how the Stimulus caused the

state experienced (e.g. *John liked Bill because he was very helpful*). As such, the Stimulus is focused.

Sanford et al investigated the role of proper names on focusing a referent. According to Sanford and Garrod (1981), entities are ranked according to their accessibility to a subsequent pronoun, whereas the roles they occupy are available as referents for definite descriptions. They argue that naming implies that the individual's identity is important and that it refers to a unique individual. By contrast, a definite description implies that their identity is not important: Any individual who fits the description in the discourse model will do.

With two-sentence texts like (2), Sanford et al (1988) found that continuations were more likely to refer to the named rather than described individual. A further experiment also found that a third sentence containing a pronoun was read faster when it referred to the named rather than described antecedent.

- (2)     (a)     The manager was dictating a letter.  
         (b)     Claire was taking shorthand.

The impetus for the experiments presented in Chapter 2 was the comparison of Stevenson et al's and Sanford et al's experiments. Stevenson et al examined thematic role focusing with two referents occupying different roles, the Stimulus and the Experiencer in state sentences, whilst both referents were introduced with a name. Sanford et al examined referents introduced with either names or descriptions in texts where each was in their own sentence and occupied the same thematic role, both being in an Agent. In the experiments in Chapter 2, thematic role focusing and name focusing were pitted together, by systematically

manipulating both thematic role and naming. This manipulation also allowed testing of the relative contribution of a referent's surface position, by controlling for the order in the referents in the sentence. The first mentioned referent is regarded as important by many researchers, due to it being the foundation for constructing an interpretation of the sentence (Gernsbacher, 1990).

Chapter 3 reports five experiments investigating centering theory's (Grosz, Joshi & Weinstein, 1983, 1995) view of the ranking of discourse referents. According to centering theory, the subject in an utterance is focused. This study was designed to test centering theory's notion of what constitutes an utterance, by examining the notion of clause subordination in order to investigate focusing in complex sentences.

The proposals from centering theory have received support from reading time studies (e.g. Gordon, Grosz & Gilliom, 1993). Faster reading times are found for sentences containing a subject pronoun referring to the subject rather than non-subject antecedent, and a pronoun is read faster than a repeated name when referring to this antecedent. From current research, it is unclear, however, what the focus is in complex sentences in which each clause has a separate subject (Kameyama, 1998, Suri & McCoy, 1994). If the clauses in a complex sentence are processed in a linear order, like a sequence of simple sentences, the subject referent in the most recent clause will be focused. By contrast, it might be that the whole sentence must be regarded as a single processing unit, with the subject of the main clause being more focused than the subject in the subordinate clause. Cooreman and Sanford (1996) have shown that a main clause subject was focused in certain complex sentences, rather than the subordinate clause subject.



In Chapter 3, two experiments investigate Kameyama's proposal that complex sentences consisting of a nonreport complement are treated like a single utterance, with the main clause subject being focused over the subordinate clause subject. Three experiments investigate Suri and McCoy's proposal that complex sentences consisting of a main clause followed by a *because* clause are also treated like a single utterance. These experiments also manipulated the thematic role (Stimulus or Experiencer) of the two referents in the main clause, which has been shown to influence focusing (Stevenson et al).

Chapter 4 reports a series of ten experiments investigating the roles of animacy, thematic role and surface position in the focusing of referents. This study was designed to compare accounts of thematic role focusing proposed by Sidner (1979, 1983) and by Stevenson et al, testing the idea that animacy may also effect the focusing of a discourse referent.

As well as sentences containing state verbs, Stevenson et al investigated thematic role preferences in transfer sentences, which contain three referents occupying Goal, Theme, and Source roles. They found that the referent occupying the Goal role was preferred in continuations, both when the Goal was mentioned first (3) and mentioned last (4).

(3)                John took the book from Bill.

(4)                John passed the book to Bill.

Sidner also claimed that some thematic roles are more focused than others. However, she proposed that the Theme is the Discourse Focus, not the Goal. She illustrated this idea with the anaphor pattern in (5). Intuitively, the preferred

antecedent of the pronoun *it* in (5b) is most likely to be *nickel*, filling the Theme role in the previous transfer sentence, even though *toy bank*, filling the Source role, would also have been acceptable.

- (5) (a) Mary took a nickel from her toy bank yesterday.  
(b) She put it on the table near Bob.

The impetus for the experiments reported in Chapter 4 was the observation of a conflict between Stevenson et al's findings and Sidner's proposals over which thematic role in transfer sentences is in focus. Stevenson et al favour the Goal, whereas Sidner favours the Theme. The attempt to resolve this led to a hypothesis about the effect of animacy on focusing. Studies of production have long shown that animacy has a powerful influence on making an entity salient. For instance, Byrne and Davidson (1985) show a general predisposition for animate entities to be mentioned before inanimate ones in utterances.

The experiments in Chapter 4 extended the production research to comprehension, examining the effect of animacy on focusing. Animacy and thematic role focusing were pitted together, by systematically manipulating the animacy of the referents and their thematic role. This manipulation also allowed testing of the relative contribution of a referent's surface position, by controlling for the order in the referents in the sentence.

Chapter 5 reports three two-part experiments investigating the effect of parallelism, in order to test centering theory's claim that an utterance has only a single site where the use of a pronoun, rather than a fuller form, can increase

coherence, as measured by faster reading times. It also investigated the role of voice (active or passive) on the parallelism effect.

According to centering theory, the subject of an utterance is focused. As mentioned above, studies of centering theory have shown that a pronoun is read faster than a repeated name when referring to the antecedent in subject position but not in non-subject position. Chambers and Smyth (1998), however, have recently shown that both subject and non-subject pronouns can simultaneously increase coherence, so long as the pronoun and its antecedent are grammatically parallel. They examined reading times to sentences like (6c).

- (6)      (a)      A fight was in full swing in the back yard.  
             (b)      Debbie punched David in the nose.  
             (c)      Then she/Debbie slugged him/David in the ribs.

Faster reading times were found with pronominalisation of either the subject or the non-subject antecedent. According to parallelism (e.g. Stevenson, Nelson & Stenning, 1995), pronoun resolution is facilitated when the pronoun occupies the same grammatical role as its antecedent.

The experiments reported in Chapter 5 were designed to further test parallelism effects by examining the impact of the passive construction on the salience of the subject referent. Along with the manipulation of the parallelism of the anaphors and antecedents in the adjacent sentences of the referential type of both the subject and non-subject anaphors, also investigated was the impact of sentence voice on the focusing of referents. According to Davidson (1984), the passive construction has an important focusing role, marking the subject as salient.

## **CHAPTER 2 – EXPERIMENTS 1-3**

## INTRODUCTION

In this chapter three experiments are described that examine the relative influences of the two semantic factors thematic roles and naming and the structural factor of surface position. The thematic role of the referent (Stevenson, Kleinman & Crawley, 1994) and whether the referent is named or described (Sanford, Moar & Garrod, 1988), and the structural factors of grammatical role and surface position of the referent (Gordon, Grosz & Gilliom, 1993) are thought to affect the focusing of a discourse referent. The aim is to determine the relative contributions of these factors to the accessibility of discourse referents. In the following sections, evidence for each of these influences is reviewed in turn.

### *Thematic Role Focusing*

Thematic roles relate the arguments associated with a verb to the verbs meaning. They characterise the relationship between a verb's arguments by denoting the roles that the arguments play. In the sentence *John hit Bill*, for example, the two arguments associated with the verb are Agent (*John*) and Patient (*Bill*). The Agent identifies the argument that performs the action. The Patient identifies the argument that the action is performed upon.

It has been argued that an argument occupying a particular thematic role may be more salient than an argument occupying a different thematic role. Thematic role focusing was originally proposed by Sidner (1979) and first tested systematically by Stevenson, Crawley and Kleinman (1994). Stevenson et al's research was

based on earlier work on 'implicit causality' verbs (Caramazza, Grober, Garvey & Yates 1977; Garvey & Caramazza, 1974; Garvey, Caramazza & Yates, 1976). Garvey and colleagues (Garvey & Caramazza, 1974, Garvey et al, 1976) argued that these verbs direct the focus of attention onto the instigator of the event that the verb denotes and, as such, biases the interpretation of a subsequent ambiguous pronoun to this referent. Garvey and Caramazza examined participants' completions to sentence fragments such as (7) and (8).

(7)                John cheated Bill because he...

(8)                John punished Bill because he...

For some verbs they found that the pronoun was typically assigned to NP1. *John* in (7) is seen as the instigator of the cheating. By contrast, for other verbs the pronoun was typically assigned to NP2. *Bill* in (8) is seen as doing something to instigate the punishing. These biases were interpreted as arising from a property of the verb: Implicit in the verb's meaning is the cause of the event it denotes and the perceived instigator of the event is focused.

Subsequent work examining different connectives, however, suggests that the effect of the connective *because* brings the event's cause into focus. Other connectives produce a different focus (Au, 1986; Ehrlich 1980; Stevenson et al). In the light of the results with different connectives, Stevenson et al proposed an alternative account of the focusing biases of verbs described above, one that places the attention directing effects of *because* within a broader model of semantic focusing. In their study of connectives, Stevenson et al used sentence continuation tasks to investigate the influence of the connectives *because*, a full stop, *so* and *and* on clauses containing verbs associated with different thematic

roles as their arguments. Since the experiments reported in the current study use only state sentences, Stevenson et al's results for state verbs are concentrated on. Sentences containing state verbs describe an event where an entity (the Stimulus) induces a psychological state in a person (the Experiencer). The preferred thematic role in state sentences was found to depend on the connective: The Stimulus is preferred with *because* and a full stop; the Experiencer is preferred with *so* and *and*. Stevenson, Knott, Oberlander and McDonald (2000) suggest that this effect of the connective is due to the connective signalling the coherence relation between the two clauses/sentences. They argue, for example, that *because* signals an Explanation relation and hence it is likely that a fragment containing *because* will be completed with an explanation of how the Stimulus caused the state experienced (e.g. *John liked Bill because he was very helpful*). By contrast, *so* signals a Result relation and hence it is likely that a fragment containing *so* will be completed by stating what the Experiencer did as a result of experiencing the state induced by the Stimulus (e.g. *John liked Bill so he gave him a present*)<sup>1</sup>.

In Experiments 1 and 2, state verbs are used, with Stimulus and Experiencer thematic roles, followed by a fragment to be completed containing a pronoun. The null connective (a full stop) is used, which, according to Stevenson et al (1994),

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<sup>1</sup> This finding for verbs describing states contrasts with the findings for verbs describing events (action and transfer verbs). When event verbs are used, Stevenson et al argue that the results suggest that the verb itself brings the thematic role most closely linked to the endpoint of the action into focus. This is the Patient in action sentences and the Goal in transfer sentences. This focus on the thematic role most closely associated with the endpoint can be thought of as resulting from the comprehender's attention moving with the description of the action from the Agent to the Recipient, so that by the end of the description, the comprehender's focus of attention is on the Recipient. Then, if a connective is encountered, this pre-existing verb evoked focus is reinforced or reduced as a function of the coherence relation signaled by the connective. For example, *so* reinforces the focus on the endpoint since it signals a Result relation or a Purpose relation, whereas *because* reduces the verb evoked focus by bringing about a shift towards the causal agent, since it signals an Explanation relation (Stevenson, Knott, Oberlander & McDonald, 2000).

acts as an implicit causal connective. The thematic role focusing hypothesis, therefore, would predict that the pronoun in a fragment would typically be interpreted as referring to the Stimulus, since the implicit causal connective will direct attention to the cause of the state denoted by the verb.

### *Names and Descriptions*

Sanford and Garrod (1981; Garrod, Freudenthal & Boyle, 1994) distinguish between entities and events in their scenario-mapping model. According to Sanford and Garrod, entities are ranked according to their accessibility to a subsequent pronoun, whereas the roles they occupy in the events described by the discourse are available as referents for definite descriptions. Sanford and Garrod also argue that names are used to identify a specific entity and contrast with descriptions by making an entity more readily accessible to a subsequent pronoun. Why should a named referent be more accessible than one introduced by a definite description? Sanford and Garrod refer to the work of Kripke (1972). According to Kripke, a name is a rigid designator; it refers to the same individual in all possible worlds. By contrast, definite descriptions refer to the set of individuals that fit the role denoted by the definite description. One reason, therefore, why a named individual may be more accessible than a described individual is that naming implies that the identity of the named individual is important and that it refers to a unique individual. By contrast, a definite description implies that the identity of the described individual is not important: Any individual who fits the description in a model of the discourse will do. Hence, Sanford and Garrod argue that comprehenders may treat named individuals (because they are identified) as more salient than described individuals.



Support for the claim that named individuals are accessible comes from a study by Sanford, Moar and Garrod (1988). They found that references to a named individual were more likely than references to a described individual in a continuation task. In a second experiment, sentences containing a pronoun referring to a named antecedent were read faster than those referring to described antecedent. So for example, (9d) was read faster when it referred to *Claire* rather than *The manager* (i.e. when the pronoun *She* was used rather than *He*).

- (9)      (a)      The manager was dictating a letter.  
            (b)      Claire was taking shorthand.  
            (c)      It was getting to be late in the afternoon.  
            (d)      He/She was beginning to feel hungry.

By contrast, a further experiment showed that reading times for sentences containing repeated definite NPs were unaffected by whether the antecedent was introduced with a name or a definite description. Further support for the claim that named individuals are more accessible comes from a study by Anderson, Garrod and Sanford (1983). They found that the reading time for sentences containing a pronoun referring to a named individual where unaffected by an episode boundary occurring between the sentence introducing the individual and the sentence containing the pronoun. By contrast, sentences containing a pronoun referring to a described individual were read slower after an episode boundary. However, in this study, the named individual was also mentioned first in the discourse and so might have been more accessible for that reason.

In the current study, Experiments 1 and 2 vary the mode of description (name or definite description) of the two potential antecedents in addition to their thematic

roles. The naming hypothesis would predict that the named individual would be referred to more often in the completions than the described individual. In Experiment 3, only the mode of description of the two potential antecedents is varied, not their thematic roles. Once again, the naming hypothesis would predict that the named individual will be referred to more often than the described individual.

### ***Surface Position***

Centering theory (Grosz, Joshi & Weinstein, 1983, 1995) gives the most explicit account of the effect of surface position on the accessibility of discourse referents. According to the theory, each utterance introduces a set of forward-looking centers (Cf) corresponding to the discourse entities. The Cf is ranked according to prominence. The structural factors surface position (Gordon, Grosz & Gilliom, 1993) and grammatical role (Brennan, Friedman & Pollard, 1987; Kameyama, 1985) are thought to be of crucial importance in determining ranking. The most highly ranked member of the Cf, called the preferred center (Cp), is a prediction about what the following utterance will be 'about'. According to the stipulations of the theory, the Cp is most accessible for mention with a subsequent pronoun.

In the studies reported here, the preference for subsequent mention as a function of the hypothesised accessibility of the two potential antecedents is investigated. That is, the study is concerned with ranking in the Cf. Hence, the overview of centering theory is confined to the Cf. (For discussion of other aspects of centering theory see Chapters 3 and 5.)

There is evidence to suggest that both initial mention and subjecthood jointly influence focusing. Sentences containing pronouns were read more rapidly than sentences containing repeated names when the anaphor refers to the first mentioned and subject referent (Hudson-D'Zmura, 1988, Hudson, Tanenhaus & Dell, 1986; Hudson-D'Zmura & Tanenhaus, 1998). Gordon, Grosz and Gilliom (1993, Experiment 5) have further shown that when initial mention and subjecthood are independently varied, sentences containing pronouns were read more rapidly than those containing repeated names when the referent of the anaphor was either the subject or the first mentioned entity, thus supporting the idea that both factors influence focusing. On the other hand, using probe recognition tasks, Gernsbacher and Hargreaves (1988) found that surface position, not subjecthood, determines the accessibility of a named referent to a repeated name anaphor. Gernsbacher (1989) also found a surface position effect with pronouns, but in that study, surface position was not varied independently of subjecthood. In the current study, the first mentioned referent and the subject referent also coincided. However, focused on here is surface position effects, although it needs to be borne in mind that the first mentioned individual is also the subject of the sentence; in the current study, first mention preferences are compatible with an explanation based on a preference for the subject referent.

A surface position effect was also found by Stevenson et al in their sentence continuation tasks, as long as there was a pronoun in the sentence fragment. In these circumstances, the thematic role preferences were most marked when the preferred thematic role was mentioned first. This suggests that the two factors of thematic role and surface position combine in their effects on the accessibility of a pronominal referent.

In Experiments 1 and 2, surface position was varied by varying the order of the Stimulus and Experiencer thematic roles in the sentence preceding the fragment to be completed, as shown in (10) and (11) below. With the some verbs, such as *envy*, the first mentioned referent is the Experiencer whereas with others, such as *irritate*, the first mentioned referent is the Stimulus.

(10)                John envied Bill. He...                [Experiencer first]

(11)                Jane irritated Mary. She...                [Stimulus first]

The surface position hypothesis would predict that the first mentioned referent should be the preferred antecedent of the pronoun, irrespective of its thematic role or its mode of description.

In summary, the specific aim of these experiments is to determine whether thematic role, naming or surface position has the greatest influence on the accessibility of discourse referents. In Experiments 1 and 2, these three factors are systematically varied. According to the thematic role hypothesis, the referent filling the Stimulus thematic role should be most accessible in the discourse model and hence the preferred referent of a subsequent pronoun. According to the naming hypothesis, the named individual should be the preferred pronominal referent. According to the surface position hypothesis, the first mentioned referent in the critical sentence should be the preferred pronominal referent. One might also expect interactions between these factors. In particular, on the basis of Stevenson et al's findings, one might expect that both thematic role and surface order will affect focusing together, such that the most preferred referent will the Stimulus when it is also mentioned first in the sentence. Of particular interest in this study is whether or not naming also interacts with these factors. Experiment 3

eliminates the influence of thematic role focusing so that the naming and surface position hypotheses can be tested in its absence.

## **EXPERIMENT 1**

This experiment investigated the relative influences of thematic role, mode of introduction and surface position on the accessibility of a pronominal referent. There was an attempt to make the materials as similar as possible to those used by Sanford et al (1988) in their study of naming versus definite descriptions as factors affecting the accessibility of a pronoun's referent. In their continuation experiment they used two-sentence texts like (12).

- (12) (a) Mr. Bloggs/The manager was dictating a letter.  
(b) Claire/The secretary was taking shorthand.

Participants had to write a third sentence maintaining the theme of the text. The results showed that if only one individual was introduced by a name then this individual was preferred as the subject of the continuation sentence, irrespective of whether the individual was introduced into the discourse first or last. In contrast to the text above, the current materials provided a pronoun as the first word of the sentence to be completed. In addition to that difference, a thematic role manipulation was also included: The sentence proceeding the fragment to be completed was a state sentence containing Stimulus and Experiencer thematic roles. The surface position of the two thematic roles in the state sentence was also varied. A filler sentence was included before the state sentence so that the two individuals mentioned in the state sentence could plausibly be referred to by repeating their names, since a pronoun might be more felicitous if the filler was

not included. Thus, the inclusion of a filler removed the possible confound from having to pronominalise either of the two referents in the critical state sentence.

If thematic role focusing takes precedence over the salience from naming, then one would expect to find a preference for continuations that referred to the Stimulus, irrespective of whether it is named or described. If naming takes precedence over thematic role focusing, then one would expect to find a preference for the named individual irrespective of thematic role. If both factors affect focusing, then one would expect to find a stronger preference when the named individual is in the Stimulus role than when the two factors diverge. If surface position also affects focusing, then one would expect any observed preferences to be more marked when the preferred referent is also mentioned first in the state sentence.

## ***Method***

### *Participants*

The participants were 64 undergraduate and postgraduate students from the University of Durham who volunteered to participate. All were native speakers of English in this and all of the experiments reported in this thesis.

### *Materials and Design*

The materials consisted of 32 texts, each made up of four sentences followed by a sentence fragment to be completed. In the first and second sentences of each text, two individuals were introduced, one with a name and one with a description, one individual in each sentence. The third sentence was a filler sentence, which did

not mention either of the individuals but maintained the theme of the text. The critical fourth sentence was the state sentence. It mentioned both individuals, one with a name and one with a definite description. The filler sentence was included to make it more felicitous to repeat the name or definite noun phrase in the state sentence when referring to the individual introduced in sentence two. The type of expression used to refer to each individual remained constant within a text. The individual introduced into the text with a name was again referred to with a name in the state sentence. The individual introduced into the text with a definite description was again referred to with a definite description in the state sentence. The state sentence had two different orders. In the Stimulus-Experiencer order the first referent in the sentence filled the Stimulus role and the last referent filled the Experiencer role (the SE order). In the Experiencer-Stimulus order the first referent in the sentence filled the Experiencer role and the last referent filled the Stimulus role (the ES order). Following the state sentence was sentence fragment consisting of a pronoun that the participants had to complete. The order of the first two sentences in the text was counterbalanced across conditions.

A two-factor repeated measures design was used. The factors were Thematic Role Order, in which either the Stimulus or the Experiencer was mentioned first in the state sentence, and Mode Of Description, in which each individual appeared in the text as either a name or a definite description. Thus, there were four versions of each text that corresponded to the four conditions in the experiment. When the order of the first two sentences in each text was counterbalanced across these conditions, there were eight versions of each text all together. These eight versions were then used to construct eight lists of materials, such that only one version of each text appeared in a list. There were, therefore, eight sentences in each of the

four conditions in each list, four of which had one order of the first two sentences and four of which had the other order. An example of the materials is shown in Table 1. (Note: In half the texts, the order of the two introductory sentences was reversed.) The full set of materials is shown in Appendix A.

**Table 1: Example of materials used in Experiment 1**

<b>Introductory sentences</b> Rob/The biker walked outside and got onto his motorcycle. Ken/The policeman was stopping traffic to give random breath tests.
<b>Filler sentence</b> Drink-driving always increased around the Christmas period.
<b>State sentence</b> <b>Stimulus mentioned first</b> Rob/The biker unsettled Ken/The policeman. <b>Experiencer mentioned first</b> Rob/The biker noticed Ken/The policeman.
<b>Sentence Fragment</b> He...

Pre-tests ensured that the definite descriptions used in the texts were unambiguous with respect to gender. The introductory sentences containing definite descriptions were presented to six independent judges who were required to state whether they thought the description referred to a male or a female. Sentences on which all judges agreed were accepted for inclusion in the experiment. Sentences where there were disagreements between judges were re-written using a new definite description and presented again to the judges. This procedure continued until all the sentences contained descriptions for which the six judges agreed on the gender of the referent.



## *Procedure*

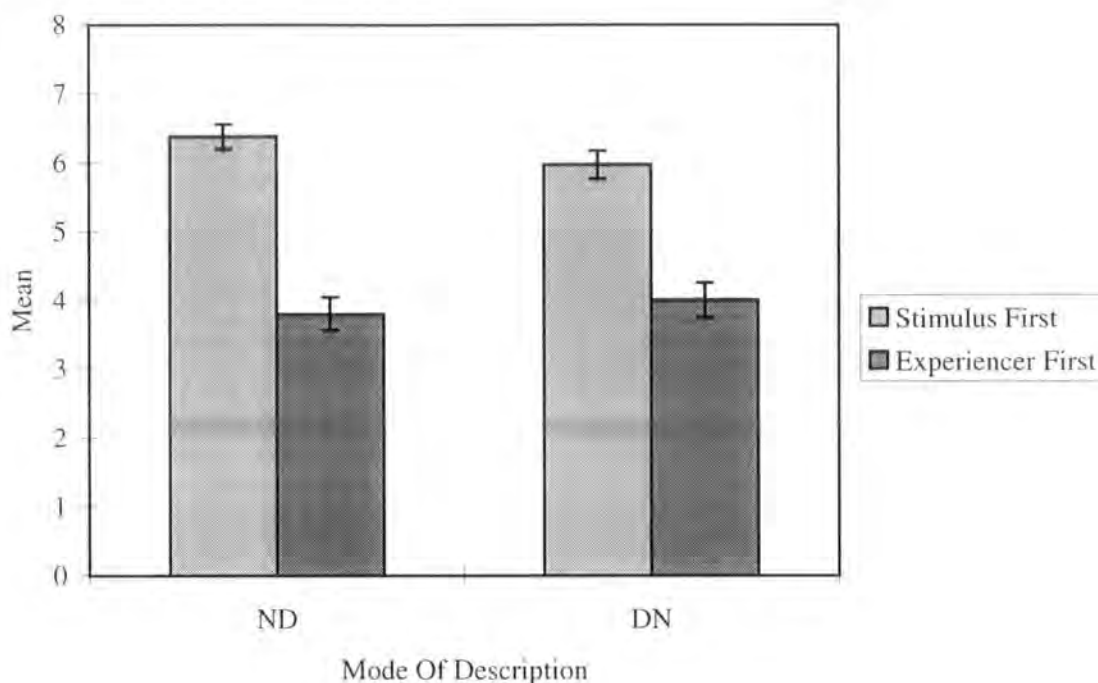
Each participant was presented with a booklet containing one of the eight lists of materials. No filler items were included. Eight participants saw each list of materials. The texts were presented in a different random order for each participant. Participants were instructed to write a continuation to each sentence fragment that maintained the theme of the text. There was no time limit but participants were advised not to spend too long on any text.

## *Results and Discussion*

Two judges used the content of each completion to determine whether the pronoun referred to the first or the second mentioned individual in the state sentence or whether the completion was unclassifiable and not to be included in the analysis. A continuation was unclassifiable if the pronoun was ambiguous (either because neither judge could decide which individual was the pronominal referent or because the two judges made different judgements) or if the content was not a logical continuation to the text. This process resulted in 3% of the continuations being judged unclassifiable and hence not included in the analyses. Since the choice of one referent for the pronoun precluded the choice of the other, the two choices were not independent. Consequently, only the references to the first mentioned individual in the critical sentence were included in the analyses. The number of references to the first mentioned referent is referred to as *First Mention Scores*. The mean first mention scores are shown in Figure 1 as a function of Thematic Role Order and Mode Of Description. The two Mode Of Description conditions are referred to as Name-Description (ND) and Description-Name (DN) to indicate how each individual in the state sentence was referred to.

For example, ND means that the first mentioned individual in the state sentence was named whereas the second mentioned was described.

**Figure 1: Mean First Mention Scores in the critical sentence**



The predictions in relation to the first mention scores are as follows: According to the naming hypothesis, first mention scores should be higher in the ND than the DN condition. According to the thematic role hypothesis and the results of Stevenson et al (1994), the first mention scores should be higher when the Stimulus is mentioned first than when it is mentioned second. Consideration of Figure 1 suggests that the first mention scores are higher when the Stimulus is mentioned first, irrespective of whether the referent was named or described.

To test between the thematic role and the naming hypotheses, two two-factor analyses of variance were carried out on the first mention scores, one on participants and the other on texts. In the participant analysis, both factors were

repeated; in the text analysis, Mode Of Description was a repeated factor and Thematic Role Order was an independent factor. The results showed a significant main effect of Thematic Role Order [ $F_1(1,63) = 50.586, p < 0.001$ ;  $F_2(1,63) = 76.769, p < 0.001$ ]. The effect of Mode Of Description was not significant, although the interaction Thematic Role Order X Mode Of Description approached the standard level of significance [ $F_1(1,63) = 3.329, p = 0.072$ ;  $F_2(1,63) = 3.329, p = 0.073$ ].

There were more references to the first mentioned individual when the Stimulus was mentioned first than when the Experiencer was mentioned first, indicating an effect of thematic role. The first mention scores when the Stimulus is mentioned second are roughly half that of the total possible, indicating that there is a split between the Stimulus preference and a first mention preference. (For the ANOVAs see Appendix B, Tables 21 and 22.)

These results suggest that certain combinations of thematic role and surface position affect the accessibility of a pronominal referent. The preference for the Stimulus was very strong when the Stimulus was mentioned first in the state sentence, but the preference for the Stimulus was reduced when the Stimulus was mentioned second. This suggests that there may be competition between choosing the Stimulus and choosing the first mentioned referent. The focusing preference for the Stimulus and the focusing preference for first mention combine to override any focusing preferences due to names over definite descriptions. We, therefore, conclude from these results that thematic role focusing and surface order take precedence over naming in making a referent accessible to a pronoun.

The naming effect observed by Sanford et al (1988) was not replicated, although there is a suggestion from the interaction that the preference for the Stimulus is strongest when the individual is named rather than described. A possible reason for the failure to replicate Sanford et al's naming effect this is that the experiment did not include all the conditions tested by them. In their experiment, all four possible combinations of name and definite description for the two individuals were included, whereas the current experiment included only the two conditions in which one individual was named and the other described. It is possible, therefore, that different strategies were involved in the two experiments depending on whether or not the two conditions in which both individuals were named and both described were included. Experiment 2 tested this possibility by including all four combinations of name and definite description. This also tests further the possibility that naming and thematic role focusing combine to favour the individual brought into focus by the two factors. Experiment 2 can check whether the interaction is a true effect or a type-2 error.

## **EXPERIMENT 2**

### ***Method***

#### ***Participants***

The participants were 64 undergraduate and postgraduate students from the University of Durham who volunteered to participate. None had participated in Experiment 1.

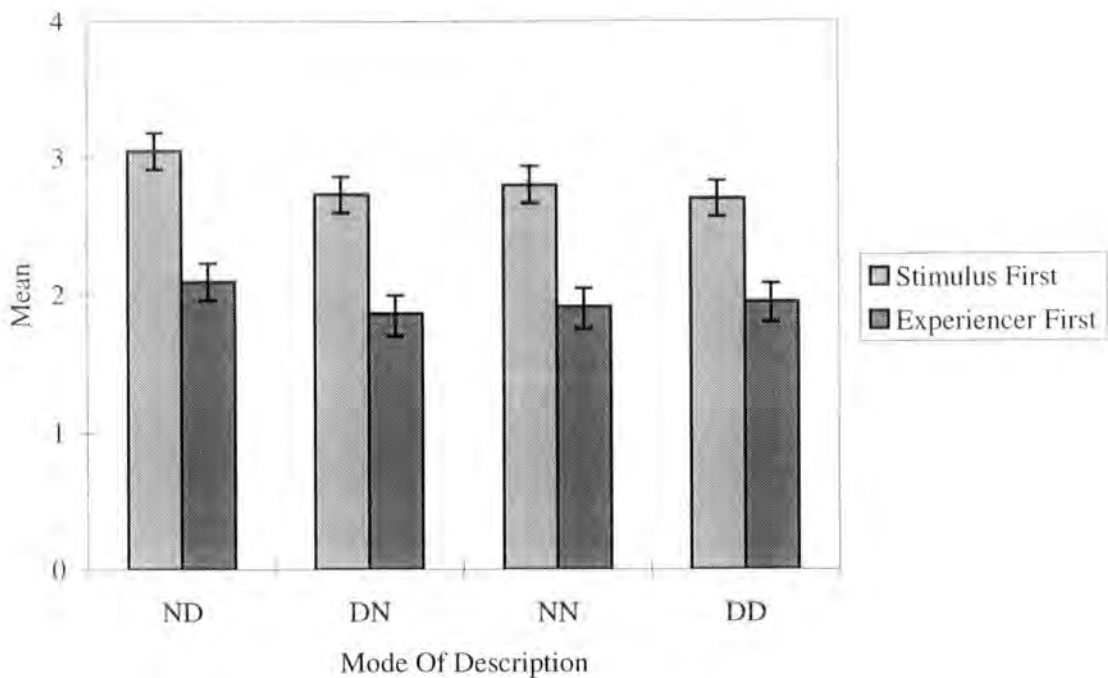
### *Design, Materials and Procedure*

The materials were the same 32 texts that were used in Experiment 1, except that the Mode Of Description factor included all four combinations of name and description. Thus, there were eight conditions all together, resulting from the combination of Thematic Role Order (2) by Mode Of Description (4). As in Experiment 1, the order of the first two sentences in each text was also counterbalanced across conditions. This combination of eight conditions and a counterbalancing factor meant that there were 16 versions of each text. Sixteen lists of materials were constructed from these versions in the same way as was done in Experiment 1. The procedure was the same as that followed in Experiment 1.

### *Results and Discussion*

The continuations were scored in the same way as in Experiment 1. The scoring resulted in 2% of the continuations being excluded from the analyses for the same reasons as those in Experiment 1. The mean first mention scores are shown in Figure 2 as a function of Thematic Role Order and Mode Of Description. Like Experiment 1, the four Mode Of Description conditions are referred to as Name-Description (ND), Description-Name (DN), Name-Name (NN) and Description-Description (DD) to indicate how the first and second mentioned individuals are referred to in the state sentence.

Figure 2: Mean First Mention Scores in the critical sentence



As was the case in Experiment 1, two two-factor analyses of variance were carried out on the first mention scores to test between the naming hypothesis and the thematic role hypothesis. One analysis was on participants and the other on texts. The results showed a significant main effect of thematic role order [ $F_1(1,64) = 23.620, p < 0.001$ ;  $F_2(1,62) = 45.584, p < 0.001$ ]. There were more references to the first mentioned individual when the Stimulus was mentioned first than when the Experiencer was mentioned first, indicating, once again, a thematic role effect. There were no other significant effects. (For the ANOVAs see Appendix B, Tables 23 and 24.)

These results replicate those of Experiment 1, lending further support to the idea that focusing preferences from thematic role and surface position take precedence over naming. The failure to find a naming effect in both Experiments 1 and 2

contrasts with the results of Sanford et al. Since Sanford et al did not include a thematic role manipulation, it is possible that the thematic role focusing in Experiments 1 and 2 may have masked any focusing arising from using a name rather than a definite description. This proposition is tested in Experiment 3.

### **EXPERIMENT 3**

Experiment 3 examines name focusing in the absence of thematic role focusing. This lack of a thematic role manipulation also enables us to control for a further potentially important difference between the materials used and those used by Sanford et al (1988). Sanford et al's text did not have the equivalent of the state sentence, in which both individuals were mentioned. Instead, the two individuals were mentioned once only, each in a different sentence. Furthermore, each individual was the subject of its sentence, whereas in the state sentence, one individual was the non-subject. This lack of grammatical equivalence between the two individuals in Experiments 1 and 2 and those in Sanford et al's study may have contributed to the failure to replicate their results. Experiment 3, therefore, mentions each individual once only, each being the subject of its clause. To keep the materials close to those used in Experiments 1 and 2, the two individuals were introduced in the same sentence, just as was the case in the state sentences in Experiments 1 and 2. Thus the critical sentence in Experiment 3 contained two clauses. Both individuals filled Agent roles in their respective clauses, as was also the case in Sanford et al's materials. Having both individuals as Agents meant that there was no possibility of any thematic role focusing due to each individual filling a different role and one role being preferred over the other. Based on the naming hypothesis, together with the results of Experiments 1 and 2, the

prediction was that name focusing would be present in this experiment because there was no thematic role focusing to over-ride it. There should be more references to the named individual than to the described individual in the ND and DN conditions, irrespective of surface position. Sanford et al found no surface position effect in their study and so there is no prediction concerning surface position here.

## ***Method***

### *Participants*

The participants were 32 undergraduate and postgraduate students from the University of Durham who volunteered to participate. None had participated in either of the two previous experiments.

### *Materials*

The materials consisted of 32 two-sentence texts. These were modifications of the texts used in Experiments 1 and 2. A number of new definite descriptions were included. The procedure for ensuring that the descriptions were unambiguous with respect to gender was identical to that used in Experiment 1. The first sentence consisted of two clauses and introduced two individuals, each being a subject of one of the two clauses. Across the 32 texts, six different connectives (their frequencies are given in the brackets) were used to conjoin the two clauses: *and* (10), *but* (7), *while* (7), *whereas* (5), *as* (2), and *when* (1). The second sentence was a filler sentence, included to maintain parity with Experiments 1 and 2.



Texts had four different versions representing the Mode Of Description factor. They involved the four possible combinations of name and definite description for the first and second individual. Thus, there were four lists of materials, each list containing eight sentences in each condition. Across the four lists each sentence appeared only once in each condition. An example of the materials is shown in Table 2. Because the two individuals were subjects of their respective clauses in a single sentence, use of a pronoun in a sentence fragment would not be felicitous and so, in this experiment, there was no sentence fragment. Instead, participants provided a new, third sentence to continue the theme of the text. The full set of materials is shown in Appendix A.

**Table 2: Example of materials used in Experiment 3**

<b>Introductory sentence</b>
<b>Named Individual Mentioned First</b>
Ken stopped every single car for on the spot breathalyser checks but the motorist had not touched a drink the whole evening.
<b>Described Individual Mentioned First</b>
The policeman stopped every single car for on the spot breathalyser checks but Rob had not touched a drink the whole evening.
<b>Filler sentence</b>
There was a Christmas crackdown on drink-driving.

### *Design and Procedure*

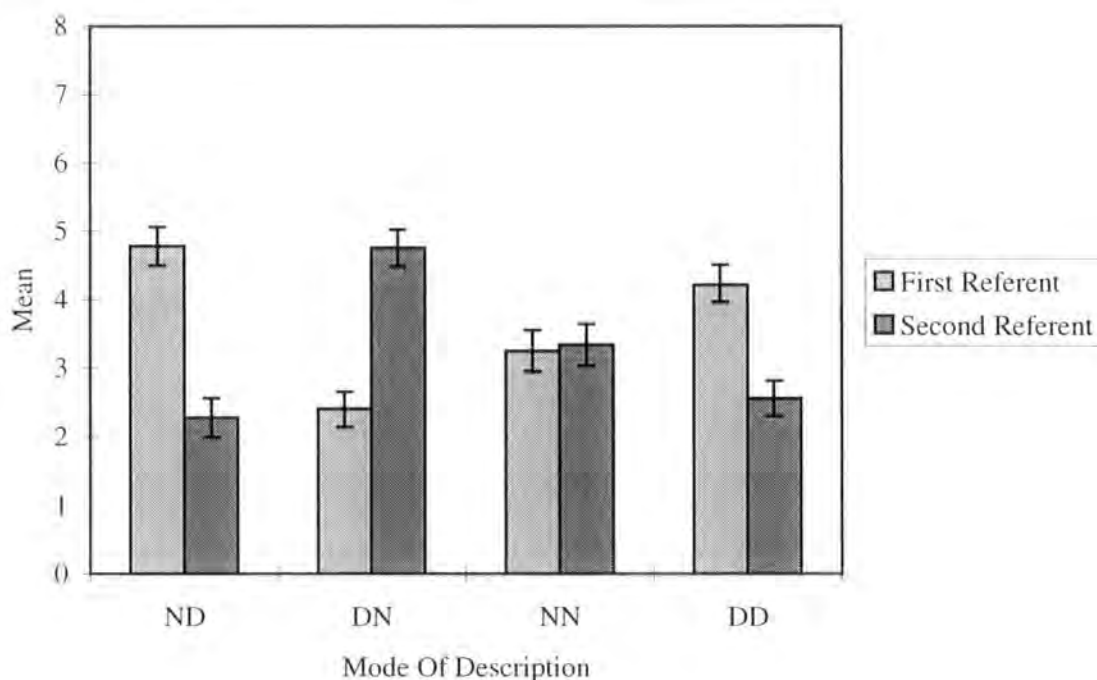
A single factor repeated measures design was used, with participants completing all four of the conditions ND, NN, DN, and DD. The procedure was the same as that followed in Experiments 1 and 2, except that participants were instructed to write a third sentence for each text that maintained the theme of the two preceding sentences.

## Results and Discussion

The continuations were scored in the same way as in Experiments 1 and 2, except that subject references were measured, since there was no pronoun. The scoring resulted in 13.8% of the continuations being excluded from the analyses. The mean number of references to both the first and the second mentioned individuals are shown in Figure 3 as a function of the Mode Of Introduction of the first and the second mentioned referents.

Under investigation in this experiment was whether or not there were more references to the named than to the described individual. Therefore, Wilcoxon tests (2-tailed) were used to compare the number of references to first mention and second mention individuals in each condition.

**Figure 3: Mean First Mention Scores in the critical sentence.**



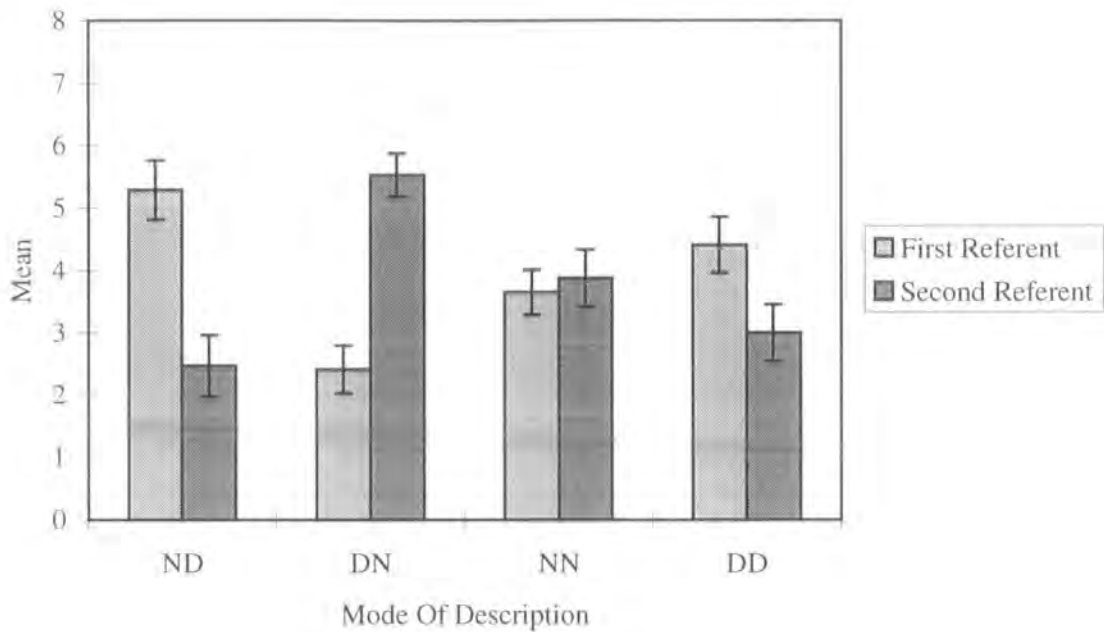
There were more references to first than to second mention individuals in the ND condition ( $p < 0.001$  [participants];  $p < 0.001$  [items]), whereas in the DN condition, there were more references to second than to first mention individuals ( $p < 0.001$  [participants];  $p < 0.001$  [items]). In the DD condition, there were more references to the first than to the second mention ( $p < 0.003$  [participants];  $p < 0.02$  [items]), whereas in the NN condition there was no significant difference in the choice of referent. (For the Wilcoxon's rank-sum tests see Appendix B, Tables 25 and 26.)

The results of the ND and DN conditions successfully replicate those of Sanford et al (1988). The named individual was the preferred referent in the completions in both conditions, irrespective of surface position. This result supports the proposition that name focusing occurs in the absence of thematic role focusing. The failure to find a preferred referent in the NN condition suggests that the two individuals are equally focused due to them both being named. The focus is split between the two, with both being equally likely to be referred to. In contrast to the NN condition, there was a first mention effect in the DD condition, consistent with the idea that surface position effects may appear when definite descriptions are used. However, this latter finding was not found by Sanford et al. It is possible that the effect only occurs when the two individuals appear in the same sentence. A more plausible alternative explanation, however, for the surface position effect in the DD condition, in contrast to Sanford et al's original result, is suggested when considering the connectives used.

### *Post-Hoc Items Analysis*

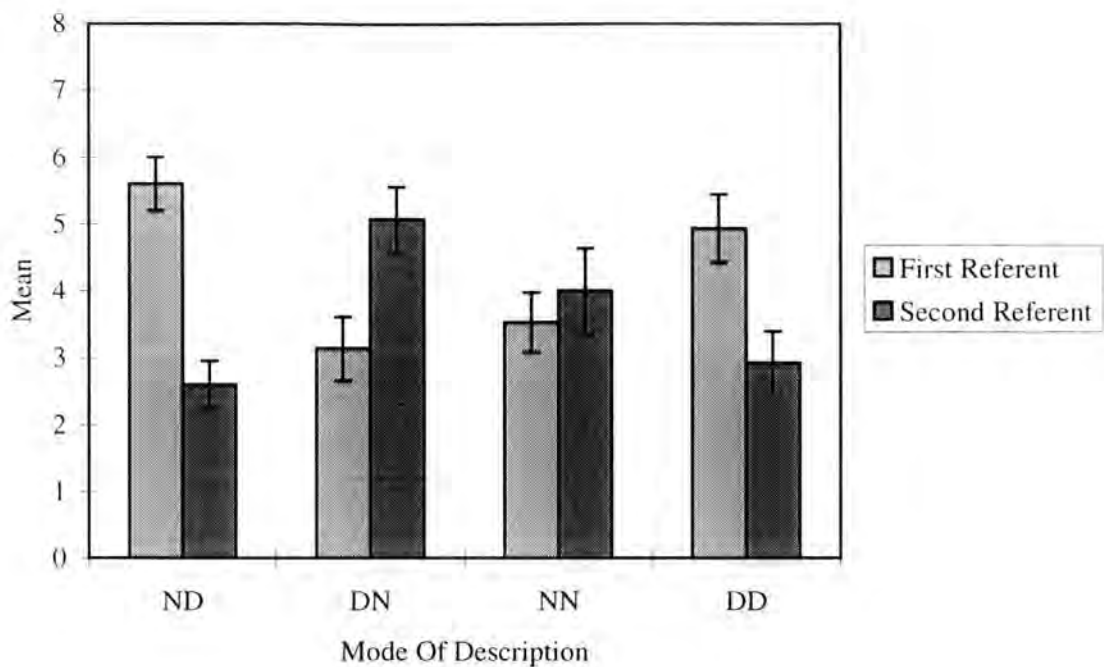
Of the different connectives used in each of the 32 texts, 15 texts contained connectives that subordinated the second clause (the connectives *while*, *whereas*, *as*, and *when*) whereas 17 did not (the connectives *and* and *but*). To investigate further the locus of the first mention preference in the DD condition in Experiment 3, a reanalysis of the items was conducted. Texts were split into those containing an introductory sentence with two main clauses (main-main), where both the first and the second mentioned individuals were both the subject of main clauses, and those containing an introductory sentence with a main clause followed by a subordinate clause (main-subordinate), where the first mentioned individual was the subject of a main clause whereas the second mentioned individual was the subject of a subordinate clause. The mean number of references to both the first and the second mentioned individuals are shown in Figure 4 for the main-main texts and in Figure 5 for the main-subordinate texts. Two separate items analyses were conducted on the two groups of items. Like the original analysis, Wilcoxon tests (2-tailed) were used to compare the number of references to first mention and second mention individuals in each condition.

Figure 4: Mean First Mention Scores for the items containing a main clause as the second conjoined clause



In the main-subordinate texts, there were more references to first than to second mention individuals in the ND condition ( $p < 0.003$  [items]) and there were more references to second than to first mention individuals in the DN condition, although narrowly missing the standard significance level ( $p = 0.059$  [items]), whereas there was no significant difference in the choice of referent in the NN condition. These results show the same pattern as the original analysis. In line with the original analysis, there were more references to the first than to the second mention individuals in the DD condition, although narrowly missing the standard significance level ( $p = 0.059$  [items]). (For the Wilcoxon's rank-sum tests see Appendix B, Table 28.)

Figure 5: Mean First Mention Scores for the items containing a subordinate clause as the second conjoined clause



In the main-main texts, there were more references to first than to second mention individuals in the ND condition ( $p < 0.02$  [items]) and there were more references to second than to first mention individuals in the DN ( $p < 0.003$  [items]), whereas there was no significant difference in the choice of referent in the NN condition. These results show the same pattern as the original analysis. In the original analysis of the DD condition, there were more references to the first than to the second mention individuals. Although the means suggest the same direction as the original results, the reanalysis of the main-main texts in the DD condition shows that there was no significant difference in the choice of referent. (For the Wilcoxon’s rank-sum tests see Appendix B, Table 27.)

The results of the items reanalysis for the ND, DN and NN conditions show that the preferences suggested by the original analysis are uninfluenced by whether the

second clause in the complex sentence is main or subordinate. However, the reanalysis for the DD condition can be taken to indicate that the surface position effect is restricted to texts where the second mentioned individual was realised in a subordinate rather than main clause.

Taken together, the results show that a single named individual is the preferred focus. When both individuals are named, the two names cancel each other out and the focus is split between the two. When both individuals are described, name focusing cannot occur. Instead, the focus is split between the two individuals when both are introduced in main clauses. However, the described individual in the main clause is focused when the second described individual is introduced in a subordinate clause. The post-hoc analysis suggests no effect of surface position, replicating Sanford et al (1988). Although the comparison of main and subordinate clauses suggests an effect of clause type, these results must be treated with caution since the analysis is post-hoc and, also, no analysis across participants is possible.

## **GENERAL DISCUSSION**

There are two main conclusions from this series of experiments. First, thematic role focusing, together with surface position focusing, takes precedence over name focusing. There was a preference for the Stimulus when mentioned first, which was reduced when the Stimulus was mentioned second. This suggests competition between the Stimulus and the first mentioned referent, replicating Stevenson et al's (1994) original finding. These preferences override any focusing preferences due to the salience of names. Second, replicating Sanford et al's (1988) finding,

name focusing occurs in the absence of thematic role focusing. There was a preference for the named rather than described referent. There is competition between referents when both are named so that the focus is split between the two. A third, tentative conclusion is suggested by regarding cases where neither referent is named. When no other cues were present, there was a main clause focus.

Why should thematic role focusing be preferred over name focusing? To answer this question, consider first the processes underlying focusing that result from thematic role and surface position on reading texts such as (13) and (14).

(13) Rob unsettled the policeman. He...

(14) The policeman noticed Rob. He...

The first mentioned individual would initially be in focus, in line with Gernsbacher's structure building framework (Gernsbacher & Hargreaves, 1988). Stevenson et al (1994) found that the verb in state sentences (containing Stimulus and Experiencer thematic roles) did not bring about a thematic role focus, so the focus would remain on the first mentioned referent until the clause was understood. Stevenson et al also found that a subsequent connective did evoke a thematic role focus. Further, a full stop was interpreted as an implicit causal connective leading the comprehender to complete the second sentence with an explanation of the first (Stevenson et al, 2000). Such an explanation is likely to describe how the Stimulus evoked the state and therefore brings the Stimulus into focus. Consequently, the pronoun is most likely to refer to the Stimulus, as found in the first two experiments. In (13) above, the Stimulus is also first mentioned and so the focus arising from the surface position effect and from the connective



both point to the same referent. By contrast, in (14) the Stimulus is second mentioned and so the focus is split between the pre-existing focus on the first mentioned referent and the new focus on the Stimulus evoked by the connective. Hence either referent is likely to be selected as the referent of the pronoun.

This focus on the Stimulus brought about by the connective revolves around the role of the Stimulus in inducing the state in the Experiencer, not because of some characteristic of the Stimulus independently of its role in the induced state. Sanford et al (1988) also considered an explanation based on roles for their observed naming effect. That is, they considered the possibility that naming may not arise from any special status associated with names. Rather, it may arise because an extra inferential step is needed to assign a named individual to a role in the discourse. This contrasts with individuals referred to by a definite noun phrase (e.g. *the waiter*), where the role in the discourse is given in the noun phrase itself. However, Sanford et al reject this possibility on the grounds that an unpublished experiment by Moar showed that contrasting a name with a name plus a definite noun phrase (e.g. *Alphonso the waiter*) did not affect the magnitude of the naming effect.

In explanation of the salience of naming, Sanford et al favour a view that says a named entity can be viewed as the principal agent in the described situation (what Sanford and Garrod, 1981, call the “thematic subject”) and so this named referent is given priority as the referent of a pronoun. That is, naming seems to affect the perceived importance of a referent, irrespective of the referent’s role in the described situation. Another possible reason why name focusing occurs may be that naming presupposes that the named referent is already known to the

comprehender. Strube and Hahn (1996), for example, have proposed a computational model of focusing in which given information is more highly focused than new information. Naming may presuppose that the referent is hearer-old for a comprehender, and is thus given despite being discourse-new. Whichever of these two interpretations is correct, they both attribute special status to the named individual *per se*, irrespective of the individual's role in the described situation.

Consistent with the focusing framework presented above is the appearance of a naming effect in Experiment 3, when there was no thematic role focusing. When, in Experiment 3, the two potential antecedents are both Agents, thematic role information cannot be used and so the perceived importance of the named individual can be used to select a referent instead.

Consider now the conclusions concerning surface position. Surface position effects co-occur with thematic role focusing (as shown in the results of Experiments 1 and 2), but not with name focusing (as shown in the results of Experiment 3). In Experiments 1 and 2, the preference for the pronoun to refer to the Stimulus only occurred when the Stimulus was also mentioned first in the sentence, indicating that the two foci competed when the Stimulus was mentioned second. By contrast, in Experiment 3, a surface position effect did not appear. A likely reason for these different patterns lies in the nature of the materials used in the three experiments. In Experiments 1 and 2, the state sentence that immediately preceded the continuation sentence referred to both the potential antecedents. By contrast, the sentence immediately preceding the continuation sentence in Experiment 3 was a filler, referring to neither of the potential antecedents.

The filler sentence between the critical sentence and the continuation sentence suggests a probable explanation for this lack of a surface position effect. Theories of structural focus, such as the structure building framework and centering theory, state that only structural information in the current sentence is used in determining what is mentioned next. According to these theories, the first mentioned referent in a sentence is focused and thus likely to be continued in the adjacent sentence. However, there is no prediction regarding the likelihood of continuing the focus in the sentence following the adjacent sentence. For instance, Gernsbacher argues that a new mental structure is built each time a new sentence is encountered. It may be that structural focus does not impinge on the representation of a new sentence structure but that semantic information such as naming does. Thus, name focusing occurs when structural information cannot be used.

Finally, the results for the NN and the DD conditions in Experiment 3 also suggest the cursory conclusion of a difference between main and subordinate clauses when name focusing does not occur. The focus was split when both referents are named due to competition between the two, since both are equally salient. Naming overrode any effects of main clause focus. The focus is, again, split when both referents are described and in main clauses since no strong focusing cues are present. However, when one referent is introduced in a main clause and the other in a subordinate clause, the main clause referent is focused. It is important to note, however, the results do not distinguish between the relative effects of thematic role focusing, surface position and main clause focusing, since continuation preferences for immediately preceding sentences containing these three factors were not examined.

Overall, the study shows differential focusing effects as a function of the nature of the cues available in the discourse. When thematic role focusing is possible, then thematic role focusing occurs in conjunction with surface position focusing; when name focusing, but not thematic role focusing or surface position focusing, is possible, then name focusing appears. Additionally, there is the suggestion that when neither thematic role focusing nor name focusing is possible, then main clause focusing occurs. These shifting patterns of focus are consistent with a model of anaphoric processing based on activation. These models assume that entities in the discourse model have various degrees of accessibility. The accessibility of discourse entities is determined by the syntactic, semantic, and pragmatic properties of how the referent is realised in the discourse. One such model has been proposed by Gernsbacher (1989). McKoon and her colleagues (Greene, McKoon & Ratcliff, 1992; McKoon, Ratcliff, Ward & Sproat, 1993; McKoon, Ward, Ratcliff & Sproat, 1993) also favour an activation-based model, but they also suppose that the pronoun acts as a cue to retrieving the pronominal referent. However, a problem with activation-based models is that the relative strengths of different factors affecting focus are difficult to specify and so a precise model is lacking. The results of the present experiments suggest ways in which the weighting of cues may be determined. First, thematic role preferences are strongly weighted, overriding the contribution of naming. This interacts together with structural position. Second, in the absence of these focus cues, naming determines salience. Additionally, it is suggested that main clauses are more strongly weighted than subordinate ones, in the absence of name focusing.

In summary, it is concluded that thematic role focusing and surface position focusing take precedence over name focusing when all three features are included

in a discourse. The focus on the Stimulus in state verb sentences arises because the implicit causal connective (the full stop) signals that the continuation should explain the induced state and such an explanation is more likely to involve the Stimulus than the Experiencer. Thus, the processes needed to retrieve the Stimulus bring it into focus. The focus on the first mentioned entity arises because the structure building framework uses the first mentioned entity as the foundation for building a mental model of the situation described by the rest of the sentence. Surface position effects were observed in Experiments 1 and 2, but not in Experiment 3. These findings were attributed to the differences between the materials used in Experiments 1 and 2 compared to Experiment 3. Experiment 3 examined continuation preferences in a sentence that did not immediately follow the critical sentence. It is argued that structural focus impacts upon what is mentioned next in the immediately adjacent sentence, not further. Thus, structural effects would not be predicted. Finally, it is argued that the results may help to refine an activation based model of anaphor resolution by indicating the relative weights for thematic role cues, surface position cues and naming, and by indicating the circumstances under which a surface position effect is likely to be found.

## **CHAPTER 3 – EXPERIMENTS 4-8**

## INTRODUCTION

Despite a substantial body of psycholinguistic research on the role of focusing on pronoun resolution, research typically only deals with simple sentences, failing to adequately address how complex sentences are processed. That is, when is the focus updated in a complex sentence? The little work that has been done on complex sentences has particularly concentrated on intra-sentential pronoun resolution. That is, how a pronoun in the second clause of a complex sentence is interpreted with respect to two potential antecedents in the first clause. However, this study is concerned with intersentential anaphora; that is, how a pronoun in one sentence is interpreted with respect to two potential antecedents in a preceding complex sentence.

Some researchers proposing the focusing approach have previously assumed that a complex sentence's clauses are processed in a linear order, like a sequence of simple sentences, with the focus updated at the end of each clause (e.g. Grosz, Joshi & Weinstein, 1995:222, Example 34; Sidner, 1983:300, Example D26). On the other hand, it might be that the whole sentence must be regarded as a single processing unit. The main aim of the present study is to investigate how focusing in complex sentences contributes to the resolution of pronouns in a subsequent sentence. Despite few experiments, strategies for treating complex sentences within a centering framework have been proposed in the computational linguistics literature, most notably by Suri and McCoy (1994) and Kameyama (1998). These proposals concern both intra- and inter-sentential anaphora and use structural

information as the main influence on focusing. There is also a body of earlier research investigating the differential processing of main and subordinate clauses. Although not concerned with focusing, they suggest that the clause connective has a role. Psycholinguistic studies with grounding in implicit causality demonstrate semantic focusing based on thematic roles and the connective used, and this too has examined both intra- and inter-sentential anaphora. Despite this, few psycholinguistic studies have investigated focusing in complex sentences. Two notable studies are Gernsbacher Hargreaves and Beeman (1989) and Cooreman and Sanford (1996). The work on intersentential anaphora with regard to structural focusing and thematic role focusing in relation to complex sentences will be considered below. First considered is the computational research on intersentential anaphora in complex sentences. This is followed by discussion of the psycholinguistic studies.

### ***Computational Research***

An increasingly predominant account of structural focusing is centering theory (Grosz, Joshi & Weinstein, 1983, 1995), originally presented as a revision of Sidner's (1979, 1983) framework for focusing and pronoun interpretation in order to simplify it. One problem with centering theory, however, is that it leaves unspecified what counts as an *utterance*. Grosz et al (1995:209) non-specifically states that an utterance "need not be a full clause". In their formalisation of the theory, Brennan, Friedman and Pollard (1987:155) also state that an utterance is "not necessarily a full clause". This vagueness means that the theory can not adequately specify how complex sentences are processed. According to centering theory, referents in an utterance are ranked for prominence according to structural



factors, with the subject being the highest ranked. It is unclear how the ranking of referents is determined in complex sentences since they have more than one clause, each with its own subject. In practice, focusing algorithms usually treat complex sentences as single utterances. However, the example in Grosz et al (1995:222, Example 34) where an intra-sentential pronoun is resolved with an antecedent in a complex sentence treats the sentence as a series of simple sentences, processed a clause at a time. Walker (1989) does note that centering theory is not explicit about how complex sentences are processed and proposes that referents be ranked according to the grammatical relations of the main verb. Brennan et al implement this into their algorithm, proposing ranking as follows: subject, object, indirect object, complement(s), adjuncts. However, this proposed ordering has not been tested, with research concentrating on the distinction between subject and object(s), in simple sentences.

Suri and McCoy (1994) proposed the RAFT/RAPR<sup>2</sup> focusing framework for resolving pronouns, which attempted to resolve some of the problems that centering theory encounters when trying to interpret pronouns with antecedents in complex sentences. It is a revision of Sidner's framework, but is, like centering theory, based on structural rather than thematic role focusing. Sidner proposes two foci, the Discourse Focus and the Actor Focus. These foci tend to refer to distinct entities, although that need not be the case. The Discourse Focus is preferably the referent in the Theme role, and is the preferred referent of non-Agent pronouns. The Actor Focus is the Agent, and is the preferred referent of Agent pronouns (see Chapter 4 for further details of Sidner's theory). As with Sidner's framework,

RAFT/RAPR maintains two foci for each sentence, the Current Focus (roughly corresponding to Sidner's Discourse Focus) and the Subject Focus (roughly corresponding to Sidner's Actor Focus). The major modification of Sidner's theory that Suri and McCoy propose is the use of grammatical roles in determining focus and resolving pronouns. In Suri and McCoy's model, the Current Focus is determined by a number of preferences, including non-subject position over subject position, old over new, pronominalised over full NP, and to continue with the same Current Focus rather than shift to a new one, although they fail to specify how these preferences might interact to determine the Current Focus. More relevant to the present discussion is Suri and McCoy's Subject Focus. In the absence of marked sentence constructions, the Subject Focus is the subject referent. Rather than Sidner's distinction between Agent and non-Agent pronouns, Suri and McCoy make a distinction between subject and non-subject pronouns, preferring subject pronouns to be resolved with the Subject Focus and non-subject pronouns to be resolved with the Current Focus.

The other important modification of Sidner's model made by Suri and McCoy is to extend it to cope with focusing in complex sentences with the form *SX because SY*. In order to consider the patterns of focusing and anaphora in complex sentences of this type, Suri and McCoy (1994; Suri, McCoy & DeCristofaro, 1999) gathered acceptability judgements for three-sentence texts such as (15) below.

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<sup>2</sup> Revised Algorithm for Focus Tracking and Revised Algorithms for Pronoun Resolution.

- (15) (a) Dodge was robbed by an ex-convict the other night.
- (b) The ex-convict tied him up because he wasn't co-operating.
- (c<sub>1</sub>) Then he took all the money and ran.
- (c<sub>2</sub>) Then he called the police.

Texts consisted of a sentence containing a subject and a non-subject referent (15a), followed by the critical complex sentence (*SX because SY*) consisting of two clauses connected by *because* (15b). The main clause in the *because* sentence (which they called the SX clause) contained a subject and a non-subject referent. The subordinate clause (which they called the SY clause) contained a subject anaphor. This was followed by a sentence containing a subject anaphor referring either to the subject of the SX clause (15c<sub>1</sub>) or the subject of the SY clause (15c<sub>2</sub>). Among the preferences found was a preference for resolving a pronoun in the sentence following the complex sentence:

Prefer to resolve Subject(S<sub>n+1</sub>) with Subject(SX).

The sentence following the complex sentence was judged more acceptable when it contained a subject pronoun referring to the subject of SX (15c<sub>1</sub>) rather than SY (15c<sub>2</sub>); there was a preference for a subject pronoun to refer to the subject of the main rather than subordinate clause. This was incorporated into their Pronoun Interpretation Algorithm in order to deal with complex sentences containing this specific type of adjunct by adding the following rule:

The Subject Focus of the sentence form "SX because SY" is Subject(SX).

This rule means that *SX because SY* sentences are not processed linearly with focus being updated after each clause. The focusing unit is the sentence, and thus the subject of the main clause is focused.

Kameyama (1998) also attempts to address the problems of focusing in complex sentences, with a particular focus on the question of what is the focusing unit. She proposes an extension of centering theory, with focusing based on structural information. In contrast to Suri and McCoy, Kameyama argues for a general preference for the clauses in complex sentences to be treated as a sequence of separate utterances, with the focus updated after each clause. That is, a pronoun in a subsequent sentence is most likely to refer to the most recent clause subject than to the main clause subject.

Kameyama does, however, outline a number of specific exceptions to the general serial processing of clauses, where subordinate clauses may be nested and the main clause has a strong influence on the focusing in the whole sentence. (According to Kameyama's notion of nested, complex sentences are broken into a hierarchy of clauses. Thus, the structure of a complex sentence could be a tree. If it is a tree, Kameyama proposes that there are multiple simultaneous centering states at different depths of embedding. Different complex sentences have different levels of embedding by which the clause may impact upon the focus. These are distinguished below.) She distinguishes between specific types of complex sentences. Although tensed conjuncts and adjuncts are processed serially, she proposes that complex sentences with untensed conjuncts or adjuncts are processed with the main clause and are not treated as separate utterances. Thus, a pronoun in a subsequent sentence is most likely to refer to the preceding main

clause subject than to the subordinate clause subject. Reported speech, including complements, is not accessible to the main focus. Kameyama argues that this signals a new discourse segment that is nested, making the subordinate clause the first clause in the nested segment. Thus, a subsequent pronoun will refer to a referent in the subordinate clause than to a referent in the main clause, provided that the pronoun is within the reported discourse segment. By contrast, a pronoun in a subsequent sentence that comes after the end of the reported discourse segment, as signalled by quotations, will refer to a referent in the main clause of the main (unnested) discourse segment. Nonreport complements and relative clauses, including coordinated clauses and adjuncts, although also nested, are accessible to the focus but the referents are not as salient as in the main (unnested) discourse segment. That is, a pronoun in a subsequent sentence is most likely to refer to the subject in the main discourse segment rather than a referent in the clause that is the nested discourse segment (Kameyama states that her analysis of relative clauses remains to be investigated further, however).

Kameyama's definition of utterance in complex sentences is adopted by Strube (1996, 1998, Strube & Hahn, 1999). Strube provides an account of centering theory based on the functional information structure (Prince, 1981) rather than structural information. Strube proposes a ranking of referents whereby hearer-old entities are ranked higher than hearer-new entities. Strube's (1998) account is presented, since this specifically concerns complex sentences. He argues for the following ranking: hearer-old in the current utterance, hearer-old in the previous utterance, hearer-new in the current utterance, hearer-new in the previous utterance. Strube's algorithm incorporates Kameyama's notion of what constitutes an utterance with complex sentences. Suggesting some support for Kameyama, in

evaluations of Strube's functional centering theory using a corpus of English and German texts, Strube's algorithm outperformed Brennan et al's algorithm based on centering theory (Strube, 1998; Strube & Hahn, 1999) and a simple linear strategy proposed by Grosz et al (Strube, 1996) when handling intra-sentential anaphora. However, this is not direct evidence supporting Kameyama's proposals, since the comparison was between structural focusing and functional focusing. Also, evaluations only concerned intra-sentential anaphora, not inter-sentential anaphora.

To summarise, Suri and McCoy and Kameyama both note that centering theory cannot adequately address how complex sentences are processed, since it leaves unspecified what counts as an utterance. It is unclear how referents may be ranked according to structural properties, since complex sentences have more than one clause, each with its own subject. They propose two contrasting strategies for how complex sentences may be handled. Suri and McCoy concentrate on complex sentences containing clauses subordinated with *because*, arguing for them to be treated as a single processing unit, with the main clause determining the focus of the whole sentence. Thus, a pronoun in a subsequent sentence will be interpreted as referring to the main clause subject than to the subordinate clause subject. In contrast to Suri and McCoy, Kameyama treats the clauses in complex sentences as a sequence of separate utterances, processed a clause at a time, with the focus updated after each clause. Thus, a pronoun in a subsequent sentence will be interpreted as referring to the most recent clause subject than to the main clause subject. Kameyama does argue for a number of exceptions to this in which, like Suri and McCoy, the main clause has a strong influence on the focusing. For instance, sentences containing nonreport complements and relative clauses,

including coordinated clauses and adjuncts, are treated more like a single utterance rather than as a sequence of separate utterances. These proposals have both had only limited analysis. Suri and McCoy (1994) based their proposals on acceptability judgements to only four critical texts, although a later corpus analysis supports the main clause subject in a *SX because SY* sentence being the subject of the following sentence (Suri et al, 1999). Kameyama substantiated her proposals with real-world text examples. Strube evaluated his algorithm, which incorporates her proposals. This outperformed Brennan et al's algorithm based on centering theory. However, only intra-sentential anaphora was considered. Also, the range of complex sentences investigated is not known.

### ***Psycholinguistic Studies***

The following section contains a discussion of the psycholinguistic studies relevant to the specific investigation of focusing in complex sentences, although there have been very few. Two notable studies are Gernsbacher, Hargreaves and Beeman (1989) and Cooreman and Sanford (1996). The main question is, can focus be updated by information from the subordinate clause of a complex sentence, or is focus only affected by the information in the main clause?

Although designed to investigate the effects of mention order, the study by Gernsbacher Hargreaves and Beeman (1989) is relevant to focusing in complex sentences. Gernsbacher et al presented a probe following complex sentences mentioning two referents, one as the subject of the first clause, the other one as the subject of the second. Sentences were coordinates (e.g. 16) or contained adverbials (*as, when, before, after*) where the main clause either preceded (17) or proceeded (18) the subordinate clause.

- (16) Tina gathered the kindling, and Lisa set up the tent.
- (17) Tina gathered the kindling as Lisa set up the tent.
- (18) As Lisa set up the tent, Tina gathered the kindling.

Although there was a recency advantage with a probe coincident with the last word in the sentence, a first mention advantage emerged with probe delays of 1400 milliseconds and 2000 milliseconds. The primacy effect suggests support for structural focusing, with a complex sentence being a single utterance, but determined by linear order, not subordination. One problem, however, with Gernsbacher et al's experiments is their use of a serial presentation method. This may bring about a serial memorising of sentences and a resulting initial recency effect and a primacy effect. This is clearly suggested by the primacy and recency found by Gernsbacher et al. Moreover, probe tasks in general have been criticised for not reflecting the processing involved in normal comprehension. Gordon, Hendrick, Ledoux and Yang (1999) suggest that participants in probe experiments simply memorise sentences as a series of words, to be searched serially when the probe appears. This thus casts doubt on Gernsbacher et al's proposed linear ordering.

As Cooreman and Sanford (1996) note in their discussion of focusing in complex sentences, there is a body of earlier research regarding the differences between main and subordinate clauses, most notably that of Townsend and Bever (1978, 1982; Bever & Townsend, 1979; Townsend, 1983). This shows that main clauses are more deeply processed than subordinate clauses, although they are not concerned specifically with focusing in complex sentences. For example, Townsend and Bever (1978) investigated differences between the focus in main



and subordinate clauses. Participants listened to complex sentences interrupted with a visually presented probe before either the last word of the initial clause or the last word of the final clause (e.g. *Since Harry wrecked his [probe] car, he's been taking the [probe] bus.*). Responses were faster to probes presented in main rather than subordinate clauses, regardless of the order that the two clauses were presented. This suggests that the main clause is focused over the subordinate clause.

As well as the main clause effect, this research also shows that the integration of clauses in a complex sentence depends on semantic factors such as the relation between the clauses. Connectives influence how main and subordinate clauses are processed, since they specify the relationship between them. Rather than complex sentences simply being a series of unrelated propositions, the clauses can be related to each other by the connective. Clark and Clark (1968), for example, found that semantically unrelated clauses conjoined with a temporal connective are better remembered in the order in which they actually occur. For instance, corresponding to the temporal order, sentences with *before* were easier to recall with the main-subordinate order. Townsend (1983) argues that the processing of the clauses is suspended until subsequent disambiguating information is encountered if the connective disrupts the expected causal/temporal ordering. Mandler (1986) found that the order effect is eliminated when unrelated clauses are semantically related by replacing temporal connectives with causal/enableness connectives. These findings together suggest a reason for why Gernsbacher et al failed to find any effects of subordination: The materials that they investigated consisted of a mixture of sentences containing connectives

shown to have different clause order preferences, yet all were grouped together in the analysis.

All in all, this body of research argues that main clauses are more prominent than subordinate clauses. However, we have also seen the differences between main and subordinate clauses are also dependent on the relations between them, as expressed by a connective. There is a large body of research based on thematic roles showing that connectives have focusing effects. This research arose from earlier research showing that the ‘implicit causality’ of the main verb affects the interpretation of a pronoun in a subordinate *because* clause (e.g. Garvey & Caramazza, 1974). Garvey and Caramazza (1974) argue the perceived instigator of the action denoted by the verb is focused regardless of whether the perceived instigator is in subject or object position. When the perceived instigator is in subject position, therefore, there is an NP1 bias, since a subsequent pronoun refers to NP1, but when the perceived instigator is in object position, there is an NP2 bias, since a subsequent pronoun refers to NP2.

Subsequent research has considered these biases in terms of thematic roles and the connective used. Different biases have been found depending on both the verb and its associated thematic roles and the connective (e.g. Au, 1986; Ehrlich, 1980; Stevenson, Crawley & Kleinman, 1994). For example, participants’ completions to sentence fragments containing state verbs and ending with *because* or a full stop typically refer to the Stimulus regardless of its position in the sentence (Stevenson et al). Such studies showing the effect of semantic focusing in complex sentences have, however, concentrated on intra-sentential anaphora (e.g. *John irritated Bill and he...*). Studies into inter-sentential anaphora (i.e. those

using the null connective: a full stop) typically investigate focusing in simple sentences (e.g. *John irritated Bill. He...*). They neglect how semantic focusing might influence focusing in complex sentences.

One study that did examine focusing in complex sentences is that of Cooreman and Sanford (1996). They investigated the influence of connective type and clause order for main and subordinate clauses on focusing. They examined the pairs of connectives *before* and *after*, *when* and *while*, and *since* and *because*, using both a sentence continuation task and a reading time task. In the continuation task, participants were presented with texts like (19) below, which shows the conditions with *after*. Texts contained a complex sentence mentioning two referents, one as the subject of the main clause, the other as the subject of the subordinate clause. The sentence had two versions, one where the main clause was first (19a<sub>1</sub>), one where the main clause was last (19a<sub>2</sub>). This was followed by a fragment consisting of a pronoun.

- (19) (a<sub>1</sub>) The conductor sneezed three times after the tenor opened his music score.  
(a<sub>2</sub>) After the tenor opened his music score the conductor sneezed three times.  
(b) He...

Cooreman and Sanford found that the pronoun was preferentially resolved with the subject of the main clause, irrespective of introduction order or the connective used. This supports Suri and McCoy's findings over a wider range of connectives. Moreover, it rules out a first mention preference as an explanation of Suri and McCoy's result where main clause subjecthood and first mention co-varied. An additional finding was a larger main clause preference in *because* sentences when the main clause was last rather than first. This suggests that an addition recency

effect operated in *because* sentences. There is thus evidence for main clause focusing, suggesting that complex sentences are a single processing unit and are not processed a clause at a time. This suggests extending Suri and McCoy's proposal to include a wider range of connectives.

The reading time study investigated two-sentence texts like (20), using the same pairs of connectives as the continuation study. The example below shows the conditions with *before*. The complex sentence again had two versions. The order of the clauses was varied so that the pronoun in the target sentence (20b) referred to the main (20a<sub>1</sub>) or the subordinate clause (20a<sub>2</sub>).

- (20)    (a<sub>1</sub>)    The porter phoned the authorities  
             before the private detective investigated the scene of the crime.
- (a<sub>2</sub>)    The private detective investigated the scene of the crime  
             before the porter phoned the authorities.
- (b)    He put the phone back down when he heard the busy signal.

Results for *before* and *after* corresponded to the continuation study results. Reading times for the target sentence were faster when the pronoun referred to the main clause subject rather than the subordinate clause subject. Results for *when* and *while* also showed that reading was facilitated for targets referring to the main clause subject. However, *while* also showed a recency effect. Targets referring to the main clause subject were read faster when the main clause was the most recent, and targets referring to the subordinate clause subject were read faster when the subordinate clause was the most recent. Finally, sentences with *because* or *since* showed no significant effects. Reading times for targets containing a

pronoun referring to the main clause subject did not differ from reading times for targets containing a pronoun referring to the subordinate clause subject.

Cooreman and Sanford do find evidence for main clause focusing, suggesting that complex sentences are a single processing unit and are not processed a clause at a time. The main clause appears to be focused with temporal connectors, however, not with causal connectors. This latter result contrasts with Suri and McCoy's proposal that the main clause subject in a *because* sentence is focused. It is, however, difficult to draw strong conclusions about focusing from the differences between the connectives, since other factors affect comprehension in complex sentences besides focusing. For example, as Cooreman and Sanford point out, causal relations are more deeply processed than temporal relations (e.g. Caron, Micko & Thurning, 1988). Cooreman and Sanford argue, therefore, that this deeper processing may enable the subordinate clause to be better integrated into the main clause during comprehension of the *because* and *since* sentences, eliminating the prominence of the main clause. Thus the reading time data of Cooreman and Sanford should perhaps be treated with caution until there is stronger evidence as to why there were no significant effects with the causal connectives and until more is known about focusing in complex sentences in general.

The current study attempts to further investigate the effects of focusing in complex sentences. It has two parts. Experiments 4 and 5 investigate Kameyama's proposals whereas Experiments 6-8 investigate Suri and McCoy's proposals. Experiments 4 and 5 examine complex sentences with a subordinated *that*-complement. These investigated structural focusing determined by subordination.

These types of complex sentences were used, rather than causal connectives, in order to limit the role of semantic relationship between the main and subordinate clauses. Although Kameyama proposes that the clauses in complex sentences typically be treated as a serial sequence of separate utterances, according to her analysis of nonreport complements, the subordinate clause subject is accessible to the focus but is not as salient as in the main clause subject. Thus, complement sentences are treated like a single utterance. A pronoun in a subsequent sentence will be interpreted as referring to the focused main clause subject. Experiments 6-8 examine complex sentences with a main clause containing a state verb followed by a subordinate *because* clause. The experiments investigate structural focusing and thematic role focusing. According to Suri and McCoy's specific analysis of *SX because SY* sentences (and Kameyama's analysis of untensed adjuncts), the subordinate clause subject is accessible to the focus but is not as salient as in the main clause subject. Thus, sentences with a causal *because* connective are treated like a single utterance. A pronoun in a subsequent sentence will be interpreted as referring to the focused main clause subject. Focusing on the (main clause) subject contrasts with research on thematic role preferences. For instance, Stevenson et al (1994) found the Stimulus in a state verb clause to be preferred for reference in a subsequent *because* clause. The Stimulus was focused regardless of its surface position. However, research on thematic roles have typically investigated focusing in simple sentences, neglecting how semantic focusing might influence focusing in complex sentences. These experiments employ a self-paced reading time methodology, rather than the sentence completion task used in the previous experiments. Focus may be assessed not only by counting antecedent choice for anaphoric reference, as with a continuation task, but by measuring an antecedent's

accessibility for subsequent reference with a pronoun, as with a reading time task. It is assumed that it is easier to integrate into new information with previous the discourse when it is coherent with the focus of attention than when it is not. Hence, a sentence will be easier to integrate, and thus read faster, when it refers to the most focused antecedent than to a less salient antecedent.

## **EXPERIMENT 4**

Experiment 4 used a self-paced reading time task to examine the focus in complex sentences containing a *that*-complement. Under investigation is the default interpretation of a subsequent pronoun. The complex sentences contained two referents, one as the subject of main clause, the other as the subject of the subordinate clause. A pronoun in a subsequent sentence will be interpreted as referring to the subordinate clause subject, the referent in the preceding utterance, if the focus in a complex sentence is updated after each clause. By contrast, according to Kameyama's analysis, complement sentences are treated like a single utterance. A pronoun in a subsequent sentence will be interpreted as referring to the main clause subject.

### ***Method***

#### *Participants*

The participants were 48 undergraduate and postgraduate students from the University of Durham who volunteered to participate.

Materials

The materials consisted of 20 three-sentence texts, each mentioning two referents. The first sentence introduced two referents. The second sentence was a complex sentence containing a *that*-complement. This again mentioned the two referents, one as the subject of the main clause, the other as the subject of the subordinate clause. The third, target sentence had two versions. The target sentence contained a pronoun that referred, by virtue of pragmatic content, either to the subject of the main clause or to the subject of the subordinate clause. The mean length of the target sentences was 6.2 words. An example text is shown in Table 3. The full set of materials is shown in Appendix A.

Table 3: Example of materials used in Experiment 4

<b>Context sentences</b> Angela sold Fiona a vacuum cleaner that wasn't working properly. Fiona claimed that she had taken money under false pretences.
<b>Target sentence</b> <b>Pronoun refers to subject of main clause</b> Then she demanded a full refund. <b>Pronoun refers to subject of subordinate clause</b> Then she gave the money back.

To ensure that the content of the target sentence was biased to the intended antecedent, an initial set of texts was constructed with target sentences designed to bring about the intended interpretation of the pronoun. These were presented to four independent judges who were asked to say which of the two individuals the pronoun in a target sentence referred to. Where there was disagreement, the text was modified and the modified text presented to a new set of four judges. This procedure continued until all texts in each version were unanimously judged to



contain a target sentence where the pronoun referred to the intended antecedent. This procedure was also used in subsequent experiments.

Complex sentences always included the connective *that*, but it is important to note that its inclusion is optional in English. It was decided to include *that* because, rather than being simply stylistic, it has a signalling function in discourse, reducing the cognitive burden for the reader/listener (Cheshire, 1996). It is argued that it alerts for the reader a need to keep in mind the immediately preceding information in order to relate it to the clause that follows (Montgomery, 1989) and is typically present when the following clause contains important information (Dixon, 1991).

Sixteen filler texts were intermixed with the experimental sentences. These were materials from a study not reported here. They were three-sentence texts, but did not contain a *that*-complement.

### *Design*

The experiment had a repeated measures design on the factor Antecedent Position of the pronoun in the target sentence (main clause vs. subordinate clause). In half the target sentences the pronoun referred to the subject of the main clause. In the remaining half the pronoun referred to the subject of the subordinate clause. Thus, there were two versions of each text.

A yes/no question was included after each text to encourage subjects to read for comprehension. Questions probed pronoun interpretation (e.g. “Was it Fiona who demanded a full refund?”). Half of the questions in each condition probed assignment of the first potential antecedent in the target, other half probed

assignment of the second potential antecedent. Half of the correct answers to the questions were 'yes' and half were 'no'.

With the two versions of each text counterbalanced across the two possible correct answers to the question, four lists were constructed, such that only one version of each text appeared in each list.

### *Procedure*

Participants carried out a self-paced reading time task with a sentence by sentence presentation. Each sentence in a text appeared one at a time in the centre of the computer screen. Prior to the experimental texts, participants were presented with 16 practise trials; eight like the experimental texts and eight like the filler texts. All texts were presented to participants in a random order.

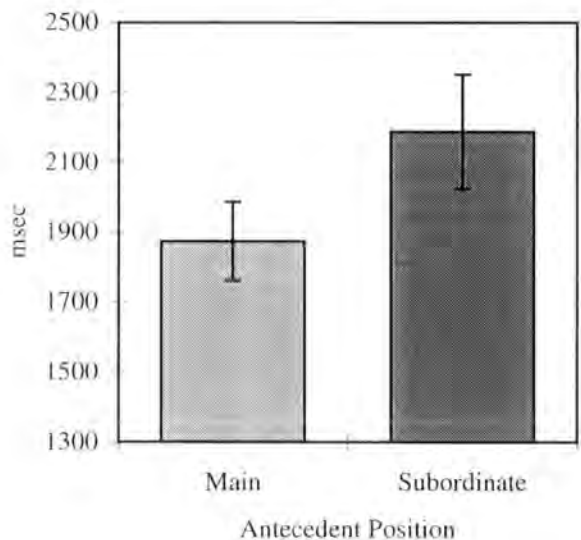
Participants were required to read and understand each sentence and press the 'space-bar' as soon as they had done so. They were instructed to read as they would normally, and try to understand the texts to the best of their ability. They were advised not to linger once the sentence had been read and understood. Before each text, "Press space-bar for next trial" was presented in the centre of the screen. Pressing the 'space-bar' removed this message and the first sentence in the text appeared in its place. Once the third sentence had been read and understood and the 'space-bar' pressed, the message "Question:-" appeared for 500 milliseconds, indicating that a question was to follow. This was then automatically replaced by the question. After answering the question by pressing one of the two keys marked 'yes' and 'no', participants were prompted to start the next trial. The time taken to

read the target sentence was recorded (in milliseconds), as were the responses to the questions.

**Results and Discussion**

Reading times for the target sentence below 350 msec were removed, as were reading times above 5000 msec (based on clear discontinuities in the data). The analysis was conducted on the data where a correct response to the question was made. (Note: As a check, analyses were also conducted on the untrimmed data, producing the same pattern of results. Analyses on untrimmed data were also conducted for all of the reading time experiments reported where trimmed data was used. In all cases, the results showed a similar pattern with trimmed and untrimmed data.) The mean reading times for the target sentences are shown in Figure 6. Inspection of the means shows that target sentences containing a pronoun referring to the subject of the main clause were read faster than target sentences containing a pronoun referring to the subject of the subordinate clause.

**Figure 6: Mean reading times for the target sentences**



The statistical analysis confirmed this observation. Analysis of variance revealed a significant effect of antecedent position [ $F_1(1,47) = 14.828, p < 0.001$ ;  $F_2(1,19) = 20.116, p < 0.001$ ]. (For the ANOVAs see Appendix B, Tables 29 and 30.)

The result from Experiment 4 shows that the main clause subject is the focus of a complex sentence containing a *that*-complement. This suggests that the sentence rather than the clause is the utterance in this type of complex sentence, supporting Kameyama's proposal for these sentence types.

One potential difficulty with the interpretation of these results is the role of the connective *then* that is present at the beginning of the target sentence following the complex sentence. Walker (1993) suggests that the connective *now* has a role in mediating the focus. Similarly, Stevenson, Knott, Oberlander, and McDonald (2000) show that the connective *next* makes the first mentioned referent more prominent. The connective *then* may draw attention to the first mentioned referent in the same way, judging by Suri and McCoy's (1994) results. They found that acceptability judgements to their texts were less consistent when *then* was omitted from the sentence following the complex sentence. Thus, the results in Experiment 4 may have arisen because the *then* made the first mentioned referent more prominent rather than because the complement clause does not update the focus. Experiment 5 ruled out this possibility by omitting the connective *then* from the sentence following the complex sentence.

## EXPERIMENT 5

Experiment 5 used a self-paced reading time task to examine the focus in complex sentences containing a *that*-complement. Like Experiment 4, under investigation

is the default interpretation of a subsequent pronoun. The complex sentences contained two referents, one as the subject of main clause, the other as the subject of the subordinate clause. A pronoun in a subsequent sentence will be interpreted as referring to the subordinate clause subject, the preceding utterance, if the focus in a complex sentence is updated after each clause. By contrast, according to Kameyama's analysis, complement sentences are treated like a single utterance. A pronoun in a subsequent sentence will be interpreted as referring to the main clause subject. However, if the connective *then* influenced the focus found in Experiment 4, it is predicted that the focus on the main clause subject will be moderated or even eliminated when *then* is absent.

## ***Method***

### *Participants*

The participants were 32 undergraduate and postgraduate students from the University of Durham who volunteered to participate.

### *Materials*

The materials consisted of 20 new three-sentence texts based on those used in Experiment 4. Their structure was almost identical, except the connective *then* was removed from the beginning of the third, target sentence. Again, target sentences had two versions. The target sentence contained a pronoun that referred either to the subject of the main clause or to the subject of the subordinate clause. The procedure for ensuring that the content of the target sentence was biased to the intended antecedent was identical to that used in Experiment 4. The mean

length of the target sentences was 6.5 words. An example text is shown Table 4. The full set of materials is shown in Appendix A.

**Table 4: Example of materials used in Experiment 5**

<b>Context sentences</b> Mary was listening to the stereo while Jane revised. Jane wished that she would turn it down.
<b>Target sentence</b> <b>Pronoun refers to subject of main clause</b> She had an exam on Monday. <b>Pronoun refers to subject of subordinate clause</b> She had it at full volume.

Sixteen filler texts were intermixed with the experimental sentences. These were materials from a study not reported here. They were three-sentence texts, but did not contain a *that*-complement.

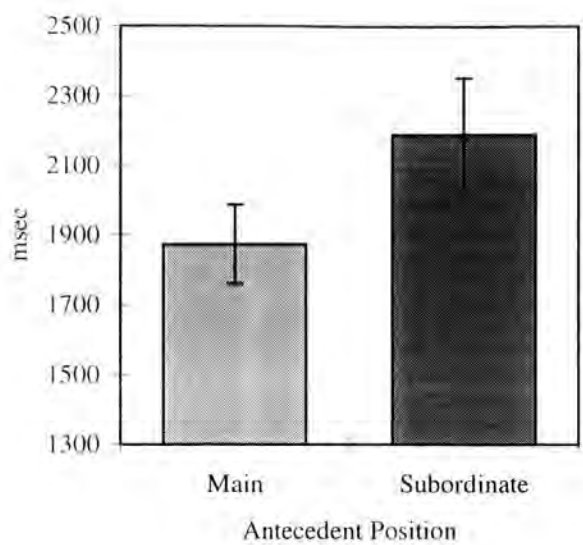
*Design and Procedure*

The design and the procedure were identical to that used in Experiment 4.

***Results and Discussion***

The reading time data for the target sentence was trimmed (based on clear discontinuities in the data). Reading times below 350 msec and above 6000 msec were removed. The analysis was conducted on the data where a correct response to the question was made. The mean reading times for the target sentences are shown in Figure 7. Inspection of the means shows that target sentences containing a pronoun referring to the subject of the main clause were read faster than target sentences containing a pronoun referring to the subject of the subordinate clause.

Figure 7: Mean reading times for the target sentences



The statistical analysis confirmed this observation. Analysis of variance revealed a significant effect of antecedent position [ $F_1(1,31) = 7.061, p < 0.02$ ;  $F_2(1,19) = 20.271, p < 0.001$ ]. (For the ANOVAs see Appendix B, Tables 31 and 32.)

The result from Experiment 5 corroborates Experiment 4. It replicates the finding using materials without the connective *then* at the beginning of the target sentence. Previous studies suggest that *then* could be influencing the focus. However, the current result indicates that the finding from Experiment 4 is a robust effect and is not dependent on the presence of *then*. The result shows that the main clause subject is the focus of a complex sentence containing a *that*-complement. This suggests that the sentence rather than the clause is the utterance in this type of complex sentence, supporting Kameyama’s proposal.

Experiments 4 and 5 clearly demonstrate the effect of structural focusing on the processing of complex sentences, whereby the referent realised in the main clause in a *that*-complement is more focused than the referent in the subordinate clause.

It has, nonetheless, previously been seen that semantic factors associated with the connective can affect the processing of complex sentences (e.g. Townsend, 1983). It is also the case that semantic factors such as the thematic role associated with a verb's argument as well as the connective can affect focusing. For instance, when the main clause of a complex sentence containing the connective *because* contains a state verb, the Stimulus of the state is focused, being preferred for mention in the following sentence, irrespective of surface position (Stevenson et al, 1994). Experiments 6 to 8 examine semantic focusing in complex sentences.

## EXPERIMENT 6

In Experiments 4 and 5 each referent was in subject position in their respective clause of the complex sentence containing a *that*-complement. Experiment 6 used a self-paced reading time task to examine the focus in complex sentences containing a main clause with a state verb and a subordinate *because* clause. Sentences contained two referents that were mentioned in the main clause of the complex sentence, one as the subject, the other as the non-subject. The *because* clause contained a subject pronoun that referred to either the subject or the non-subject of the main clause. Under investigation is the default interpretation of a subsequent pronoun. According to Suri and McCoy's analysis, a pronoun in a subsequent sentence will be interpreted as referring to the subject rather than non-subject of the main clause. Also under investigation was the role of thematic role preferences. The main clause in the complex sentence had two versions, one with the Stimulus as the subject and the Experiencer as the non-subject (the SE order), and one with the Experiencer as the subject and the Stimulus as the non-subject (the ES order). According to Stevenson et al (1994), a pronoun in a subsequent



sentence will be interpreted as referring to the Stimulus rather than Experiencer in the main clause, irrespective of surface position.

## ***Method***

### *Participants*

The participants were 64 undergraduate and postgraduate students from the University of Durham who volunteered to participate.

### *Materials*

The materials consisted of 24 three-sentence texts mentioning two referents. The first sentence introduced the referents with a name. The second sentence was a complex sentence consisting of a state verb clause and a *because* clause. One referent was the subject of the main clause, the other was the non-subject. The *because* clause contained a pronoun that referred to the referent occupying the Stimulus role in the main clause. The second sentence had two different versions, reflecting the two possible orders of the state verb. In one version, the Stimulus was the first referent, the subject (the SE order). In the second version, the Stimulus was the second referent, the non-subject (the ES order). Thus, the pronoun in the *because* clause could refer either to the subject or the non-subject of the main clause, since it always referred to the Stimulus. The third, target sentence had two versions. The target sentence contained a pronoun that referred, by virtue of pragmatic content, either to the Stimulus or the Experiencer in the main clause, which could be either the subject or the non-subject of the main clause. The procedure for ensuring that the content of the target sentence was biased to the intended antecedent was identical to that used in the previous

experiments. The mean length of the target sentences was 6.4 words. An example text with the SE order of the main clause is shown in Table 5. An example text with the ES order of the main clause is shown in Table 6. The full set of materials is shown in Appendix A.

**Table 5: Example of materials used in Experiment 6, containing a *because* sentence with the SE version**

<b>Context sentence</b> David was up before Keith in the courtroom.
<b><i>Because</i> sentence (pronoun refers to the Stimulus)</b> Keith worried David because he usually gave out harsh sentences.
<b>Target sentence</b>  <b>Pronoun refers to the main clause subject</b> He would ignore a plea for leniency.  <b>Pronoun refers to the main clause non-subject</b> He suddenly tried to make an escape.

**Table 6: Example of materials used in Experiment 6, containing a *because* sentence with the ES version**

<b>Context sentence</b> David was up before Keith in the courtroom.
<b><i>Because</i> sentence (pronoun refers to the Stimulus)</b> Keith resented David because he showed no remorse for the crime.
<b>Target sentence</b>  <b>Pronoun refers to the main clause subject</b> He gave a very harsh sentence.  <b>Pronoun refers to the main clause non-subject</b> He was sentenced to five years.

Texts thus had four possible versions: the second, complex sentence contained a main clause where either the Stimulus or the Experiencer was the subject; the

target sentence contained a pronoun that referred either to the subject of the non-subject of the main clause.

### *Design*

The experiment had a repeated measures design on the factors Antecedent Position of the pronoun in the target sentence (subject of main clause vs. non-subject of main clause) and Thematic Role Order (SE vs. ES). In half the target sentences the pronoun referred to the subject of the main clause. In the remaining half the pronoun referred to the non-subject.

Like previous experiments, a yes/no question was included after each probing pronoun interpretation. With the four versions of each text counterbalanced across the two possible correct answers to the question, eight lists were constructed, such that only one version of each text appeared in each list.

Sixteen filler texts were intermixed with the experimental sentences. These were materials from a study not reported here.

### *Procedure*

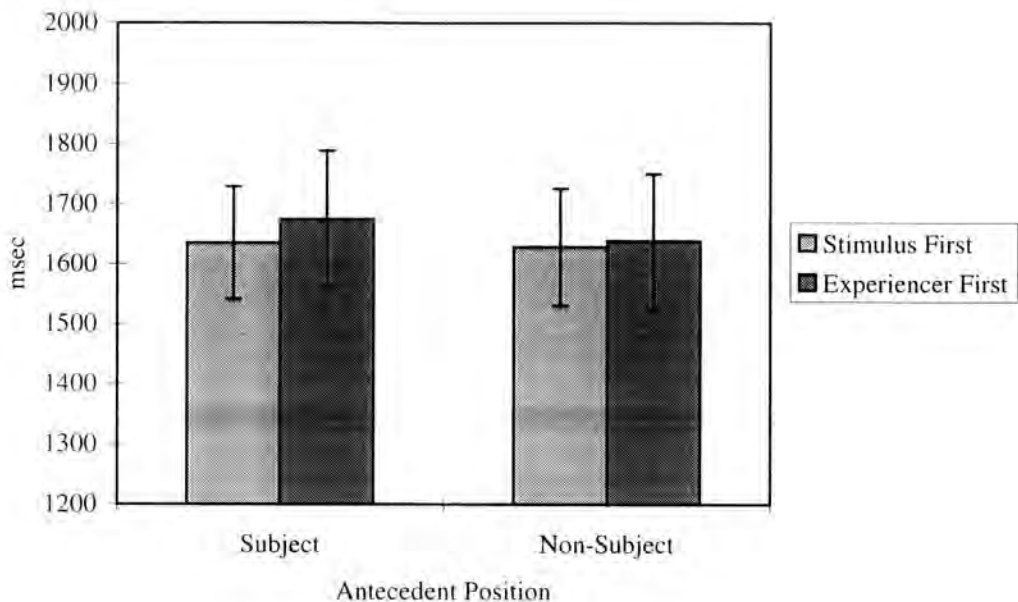
The procedure was identical to that used in previous experiments.

### ***Results and Discussion***

The reading time data for the target sentence was trimmed (based on clear discontinuities in the data). Reading times below 350 msec and above 5500 msec were removed. The analysis was conducted on the data where a correct response

to the question was made. The mean reading times for the target sentences are shown in Figure 8.

Figure 8: Mean reading times for the target sentences



Inspection of the means shows no difference in the reading times for the target sentence with any of the four versions of the texts. The statistical analysis confirmed this observation. Analysis of variance revealed no significant effect of the factors Thematic Role Order or Antecedent Position of the pronoun in the target sentence, or the interaction between the two. (For the ANOVAs see Appendix B, Tables 33 and 34.)

The results of Experiment 6 do not support Suri and McCoy’s notion of focusing, which would predict that targets would be read faster when the pronoun referred to the subject in the main clause in the complex sentence, regardless of the main clauses thematic role or the referent referred to in the *because* clause. They show no clear effect of main clause focusing, nor of thematic role focusing, where the

targets referring to the Stimulus in the main clause might be expected to be read fastest.

There are a number of possible reasons for the lack of significant results. One possibility concerns the depths of processing of main clauses and causally related subordinate clauses. The null result is in line with the reading time experiment carried out previously by Cooreman and Sanford. As mentioned above, they found no significant effects on reading times to sentences containing a pronoun following sentences with the causal connectives *because* or *since*. With causal connectives, Cooreman and Sanford argue that the causal relation between main and subordinate clauses means that the subordinate clause is processed more deeply, eliminating the focus on the main clause. A second possibility concerns the focus on the Stimulus. Stevenson et al (2000) suggest that for state verbs the connective *because* signals an Explanation relation which entails that the *because* clause will preferably be an explanation of how the Stimulus caused the state experienced (e.g. *John liked Bill because he was very helpful*). It could be that the focus on the Stimulus lessens once the entailed explanation is fulfilled, that is, when the explicit cause is mentioned in the *because* clause. This entails that the Stimulus would not be more focused than the Experiencer in the materials used in Experiment 6, since the pronoun in the *because* clause always referred to the Stimulus. An alternative explanation concerns the plausibility of the target sentences. Although sentences were matched for length and pre-tests ensured that the pronoun referred to the intended antecedent, sentences were not matched for

plausibility<sup>3</sup>. Implausible sentences generally take longer to read than more plausible ones (e.g. Traxler & Pickering, 1996). It is possible that some sentences were more plausible than others were, and that this eliminated the effects of the focus. Experiments 7 and 8 attempts to address these issues and further examine semantic focusing in the complex sentences investigated in Experiment 6.

## EXPERIMENT 7

Experiment 7 investigated further the results from Experiment 6. It used a continuation task as an initial examination of the focus in complex sentences containing a main clause with a state verb and a subordinate *because* clause. The experiment was used as a pilot study for Experiment 8, which employs a reading time task. Sentences contained two referents that were mentioned in the main clause of the complex sentence, one as the subject, the other as the non-subject. The *because* clause containing a subject pronoun that referred to either the subject or the non-subject of the main clause. Unlike Experiment 6, this could either be the Stimulus or the Experiencer, not just the Stimulus, as was the case in Experiment 6. Participants were instructed to write a further sentence that followed on from this complex sentence. The question of interest is which referent will be the preferred subject referent in the continuation, the subject or the Stimulus in the main clause?

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<sup>3</sup> Both Experiment 4 and Experiment 5 also did not use materials that were controlled for plausibility. It is nonetheless, argued that the finding of a main clause focus is a true effect rather than an effect of plausibility of the targets. The former conclusion is supported on two grounds. Firstly, this result was found in two separate experiments, each using a different set of materials. Secondly, across the two experiments, the results were highly significant in the items analyses, in addition to the participants analyses, suggesting that the effect existed for all of the items.

As a contrast to complex sentences containing state verbs, materials were also included which did not exhibit implicit causality. McKoon, Greene and Ratcliff (1993) define implicit causality as identifying “the argument that initiates an action or evokes a response” (1993:12). In an earlier study, Greene, McKoon and Ratcliff (1992) conducted an experiment with materials containing clauses that did not fit McKoon et al’s analysis of implicit causality. Examples included *went to visit*, *poured something for*, and *accidentally scratched*. McKoon et al (1993, Experiment 7) subsequently showed that these verbs do not exhibit implicit causality and behave differently from those exhibiting implicit causality. Whereas verbs with implicit causality show focusing from thematic role preferences, McKoon et al found that non-implicit causality cases do not. Their Experiment 7 instead showed that both referents were equally focused. Thus, from the previous discussion of findings, studies suggest that the precise nature of focusing depends on whether or not a clause exhibits implicit causality (see also, Poesio & Stevenson, to appear, for a review). It was, therefore, decided to include materials that contained non-implicit causality verbs in addition to the materials containing state verbs (i.e. implicit causality verbs) in order to contrast the effects of focusing. These materials also consist of a main clause that mentions two referents, one as the subject, the other as the non-subject, but the main clause does not exhibit implicit causality. The verbs in the main clauses were taken from McKoon et al’s materials. The main clause is followed by a *because* clause that refers to one of the two referents with a subject pronoun. Again, the question of interest is which referent is referred to in the subject position in the continuation, the subject or non-subject of the main clause, and whether the focus is influenced by a referent being either the Stimulus or the Experiencer in the main clause?

## *Method*

### *Participants*

The participants were 16 undergraduate and postgraduate students from the University of Durham who volunteered to participate.

### *Materials*

The materials consisted of 32 new two-sentence texts, each mentioning two referents. These were similar to those used in Experiment 6, except that in Experiment 6 the pronoun in the *because* clause always referred to the Stimulus only whereas here it referred either to the Stimulus or the Experiencer in the state verb clause. The procedure for ensuring that the content of the sentence was biased so that the pronoun in the *because* clause referred to the intended antecedent was identical to that used in previous experiments. Since this was a continuation task, no third, target sentence was included. Instead, participants provided a third sentence.

Each text was one of three types. Eight texts contained a second sentence where the main clause contained a state verb with a SE order. Eight texts contained a second sentence where the main clause contained a state verb with an ES order. Sixteen texts contained a second sentence where the main clause had no implicit causality. The clauses of the no implicit causality type were modifications of materials used in McKoon et al (1993, Experiment 7). An example text with the SE order of the main clause is shown in Table 7. An example text with the ES order of the main clause is shown in Table 8. An example text with a main clause



with no implicit causality is shown in Table 9. The full set of materials is shown in Appendix A.

Table 7: Example of materials used in Experiment 7, containing a *because* sentence with the SE version, where the Stimulus is the subject of the main clause

<b>Context sentence</b>
Mary tried to revise but Jane was playing music.
<b><i>Because</i> sentence where pronoun refers to subject of main clause (Stim.)</b>
Jane began to aggravate Mary because she had it at full volume.
<b><i>Because</i> sentence where pronoun refers to non-subject of main clause (Exp.)</b>
Jane began to aggravate Mary because had an exam on Monday.

Table 8: Example of materials used in Experiment 7, containing a *because* sentence with the ES version, where the Experiencer is the subject of the main clause

<b>Context sentence</b>
Mary came to try and repair Jane’s car.
<b><i>Because</i> sentence where pronoun refers to subject of main clause (Exp.)</b>
Jane really did appreciate Mary because she knew nothing about fixing cars.
<b><i>Because</i> sentence where pronoun refers to non-subject of main clause (Stim.)</b>
Jane really did appreciate Mary because she knew everything about fixing cars.

Table 9: Example of materials used in Experiment 7, containing a *because* sentence where the main clause exhibits no implicit causality

<b>Context sentence</b>
Mary had got Jane to cover at work for a week.
<b><i>Because</i> sentence with no implicit causality</b>
<b><i>Because</i> sentence where pronoun refers to subject of main clause</b>
Jane took over the shift for Mary because she needed the extra money.
<b><i>Because</i> sentence where pronoun refers to non-subject of main clause</b>
Jane took over the shift for Mary because she really needed a holiday.

The second sentence’s main clause had either the SE order, the ES order, or exhibited no implicit causality. The *because* clause contained a pronoun that

referred either to the subject or non-subject of the main clause. Texts thus had six versions.

### *Design*

The experiment had three factors Antecedent Position of the referent in subject position in the continuation (subject of main clause vs. non-subject of main clause) and Sentence Type (SE vs. ES vs. no implicit causality).

### *Procedure*

Texts were presented to participants in booklets, with each participant seeing each text in only one of its conditions. In half of the texts in each condition, the pronoun referred to the subject of the main clause. In the remaining half, it referred to the non-subject of the main clause. The four lists of materials ensured that across the experiment as a whole, each sentence appeared equally often in each version. Presentation order was randomised for each participant. Following each text was a series of dots indicating that the participant was required to write a third sentence that continued the text's theme. There was no time limit but participants were advised not to spend too long on any one.

### ***Results and Discussion***

Participant's completions were examined to determine which referent was referred to. A judge determined whether the first or the second mentioned referent in the complex sentence was referred to in the subject position, or whether the completion was unclassifiable and not to be included in the analysis. A completion was judged to be unclassifiable if reference was ambiguous, not a

logical continuation to the text, or a plural reference. This process resulted in 6.8% of the continuations being judged unclassifiable and hence not included in the analyses. As a reliability check, a sample of 25% of the scored completions was presented to a second judge to check the degree of agreement. If disagreement was 10% or more, all completions were to be re-scored and the reliability check taken again. This situation did not arise.

Under investigation in this experiment was whether or not there were more references to one individual or another, as a function of Sentence Type. Therefore, Wilcoxon tests (2-tailed) were used to compare the number of references to first mention and second mention individuals in each condition. Since there were double the amount of texts with a non-implicit causality main clause compared to either the SE texts or the ES texts, the raw scores for participants for the texts containing state verb main clauses were transformed by doubling the raw scores in order to make all the data comparable. The mean number of references to both the first and the second mentioned individuals are shown in Table 10 below as a function of Sentence Type and Antecedent Position. Also shown are the differences scores.

**Table 10: Mean scores for the first and the second antecedent in the critical sentence and the Difference Scores**

Sentence Type:	Grammatical Role:	1st Antecedent	2nd Antecedent	Difference Score
SE	Subject	2.00	5.63	-3.63
	Object	2.63	5.00	-2.37
ES	Subject	4.38	3.13	1.25
	Object	5.13	2.50	2.63
No Implicit	Subject	3.19	3.94	-0.75
Causality	Object	3.38	4.00	-0.62

First considering the texts with a *because* clause referring to the antecedent in subject position, there were more references to the second than to the first mentioned individual in SE sentences ( $p < 0.002$  [participants];  $p = 0.05$  [items]). Although the means in ES sentences are in the direction suggesting that there were more references to the first than to the second mentioned individual, the analysis was not significant. There was no difference for no implicit causality sentences. For texts with a *because* clause referring to the antecedent in object position, there were more references to the second than to the first mentioned individual in SE sentences ( $p < 0.02$  [participants];  $p < 0.03$  [items]), no difference for no implicit causality sentences, and more references to the first than to the second mentioned individual, although this was only marginally significant across items ( $p < 0.009$  [participants];  $p = 0.01$  [items]). (For the Wilcoxon's rank-sum tests see Appendix B, Tables 35 and 36.) Thus, the Wilcoxon tests show a general preference for the Experiencer rather than the Stimulus (with the exception that the texts with *ES because Subject* did not reach significance), and that both referents were equally preferred in the texts with no implicit causality sentences.

In order to check whether or not there was also a preference for referring to the first antecedent or to the second antecedent, *Difference Scores* were calculated by subtracting the number of times the last mentioned referent was chosen from the number of times the first mentioned referent was chosen. The greater the positive number, the greater the first mention preference, the greater negative the number, the greater the second mention preference. Inspection of the difference scores in Table 10 above suggest a second antecedent preference in SE sentences (i.e. the Experiencer), a slight first antecedent preference in SE sentences ES sentences (i.e. the Experiencer), and no clear preference for either the first or second

antecedent in no implicit causality sentences. Anovas were used to test for such differences. In the participants analysis Sentence Type and Antecedent Position were repeated measures, whereas in the items analysis Antecedent Position was repeated and Sentence Type was independent.

Confirming the preferences suggested above, the analyses showed a significant effect of Sentence Type [ $F_1 (1,15) = 13.884, p < 0.003$ ;  $F_2 (1,29) = 7.846, p < 0.003$ ], whereas the effect of Antecedent Position and the interaction Sentence Type X Antecedent Position was not significant. (For the ANOVAs see Appendix B, Tables 37 and 38.)

Consideration of the difference scores also suggests an explanation for the texts with *ES because Subject* not reaching significance. The greater the positive number for the difference scores, the greater the first mention preference, the greater negative the number, the greater the second mention preference. The second mention preferences in the SE sentences (which indicate an Experiencer preference) is larger than the first mention preferences in the ES sentences (which indicate an Experiencer preference). This suggests the effects of both thematic role preferences for the Experiencer and a recency effect; in SE sentences, the Experiencer is the most recent referent, whereas in ES sentences, the Experiencer is not the most recent referent, as such, the Experiencer effect competes with the most recent referent in the main clause.

All in all, the results do not support Suri and McCoy's view of focusing in *SX because SY* complex sentences, which predicts a general preference for the subject in the main clause, regardless of its thematic role in the main clause or mention in the following *because* clause. The finding of equal preferences for the first and

second mentioned antecedents in no implicit causality sentences is in line with the pattern of results found by McKoon et al (1993, Experiment 7). The recency effect with the results from other studies of thematic role focusing. Stevenson et al (1994), for example, found a recency effect in conjunction with a thematic role effect in their sentence continuation studies, when the continuation was a complete sentence and the fragment to be completed did not contain a pronoun. This pattern of results was also found in the experiments reported in Chapter 4. The Experiencer preference, however, is not typically found in thematic role experiments with the connective *because*, which support instead a Stimulus preference. It is not clear from current research why the Experiencer is focused here. Experiment 8 aims to test further focusing in the kind of complex sentences investigated in Experiments 6 and 7.

## **EXPERIMENT 8**

Experiment 8 used a reading time task to investigate further the results from Experiments 6 and 7. Experiment 8 was similar to Experiment 6, except the pronoun in the *because* clause could refer to either the Stimulus or the Experiencer, not just the Stimulus as was the case in Experiment 6. Under investigation is the default interpretation of a subsequent pronoun. According to Suri and McCoy's analysis, a pronoun in a subsequent sentence will be interpreted as referring to the subject rather than non-subject of the main clause. Also under investigation was the role of thematic role preferences. The main clause in the complex sentence had two versions, one with the Stimulus as the subject and the Experiencer as the non-subject (the SE order), and one with the Experiencer as the subject and the Stimulus as the non-subject (the ES order). According to

Stevenson et al, a pronoun in a subsequent sentence will be interpreted as referring to the Stimulus rather than Experiencer in the main clause, irrespective of surface position.

## ***Method***

### *Participants*

The participants were 64 undergraduate and postgraduate students from the University of Durham who volunteered or were paid a nominal sum for their participation.

### *Materials*

The materials consisted of 32 new three-sentence texts based on those used in Experiment 7. Experiment 8 used a reading time task and so a third, target sentence was included. Targets had had two versions, containing a pronoun that referred either to the Stimulus or the Experiencer in the main clause. The procedure for ensuring that the content was biased to the intended antecedent was identical to that used in the previous experiments. The mean length of the target sentences was 6.3 words.

Sixteen texts contained a second sentence where the main clause contained a state verb with the SE order. Sixteen texts contained a second sentence where the main clause contained a state verb with the ES order. Unlike Experiment 7, complex sentences with no implicit causality were not included. Texts thus had four versions. The second sentence contained a main clause where either the Stimulus or the Experiencer was the subject (SE and ES orders, respectively); the target

sentence contained a pronoun that referred either to the subject or non-subject of the main clause. An example text with the SE order of the main clause is shown in Table 11. An example text with the ES order of the main clause is shown in Table 12. The full set of materials is shown in Appendix A.

**Table 11: Example of materials used in Experiment 8, containing a *because* sentence with the S-E version, where the Stimulus is the subject of the main clause**

<b>Context sentence</b> Henry convicted Derek for committing the armed robbery.
<b><i>Because</i> sentence where pronoun refers to subject of main clause (Stim.)</b> Derek angered Henry because he showed no remorse for the crime.
<b><i>Because</i> sentence where pronoun refers to non-subject of main clause (Exp.)</b> Derek angered Henry because he especially hated violent criminals.
<b>Target sentence</b>  <b>Pronoun refers to subject of main clause (Stim.)</b> He was given the maximum sentence.  <b>Pronoun refers to non-subject of main clause (Exp.)</b> He gave out the maximum sentence.

**Table 12: Example of materials used in Experiment 8, containing a *because* sentence with the E-S version, where the Experiencer is the subject of the main clause**

<b>Context sentence</b> Colin stared at Jason in a threatening manner.
<b><i>Because</i> sentence where pronoun refers to subject of main clause (Exp.)</b> Jason feared Colin because he was frightened of bullies.
<b><i>Because</i> sentence where pronoun refers to non-subject of main clause (Stim.)</b> Jason feared Colin because he could be very aggressive.
<b>Target sentence</b>  <b>Pronoun refers to subject of main clause (Exp.)</b> He had always been very timid.  <b>Pronoun refers to non-subject of main clause (Stim.)</b> He had a reputation for fighting.



To create the final set of experimental materials, a plausibility pretest was conducted to ensure that the plausibilities of each version of each text were matched as far as possible. Twenty-four participants rated the 32 texts for plausibility on a scale from 1 (very implausible) to 7 (very plausible). Ratings were collected for all eight possible versions of each text: texts with a complex sentence containing a SE verb and a *because* clause mentioning the Stimulus followed by target sentence referring to the subject in the main clause (SE-Stim-Subj); SE-Stim-Non-Subj; SE-Exp-Subj; SE-Exp-Non-Subj; ES-Stim-Subj; ES-Stim-Non-Subj; ES-Exp-Subj; ES-Exp-Non-Subj. Each text was presented with repeated names in the place of pronouns. All eight versions were rated plausible (for the mean ratings for each text see Appendix B, Table 39). Participants also rated *incorrect* versions of each text in which the text's other repeated name was in the place of the pronouns. All eight versions were rated implausible (for the mean ratings for each text see Appendix B, Table 40). Repeated measures analysis of variance were conducted on the ratings, one on the correct text and one on the incorrect texts treating items as the random factor. The analyses showed no differences in the plausibility across conditions for the correct texts and the incorrect texts.

### *Design*

The experiment had a repeated measures design on the factors Thematic Role Order (SE vs. ES), the thematic role of the referent in the main clause referred to in the Subordinate Clause (Stimulus vs. Experiencer), and Antecedent Position of the pronoun in the target sentence (subject of main clause vs. non-subject of main clause). In the participants analysis Thematic Role Order, Subordinate Clause, and

Antecedent Position were repeated measures, whereas in the items analysis Subordinate Clause and Antecedent Position were repeated and Thematic Role Order was independent.

### Procedure

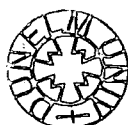
The procedure was the identical to that outlined in Experiment 4.

### Results and Discussion

The reading time data for the target sentence was trimmed (based on clear discontinuities in the data). Reading times below 350 msec and above 8000 msec were removed. The data for both correct and incorrect responses was used in the analysis, since removing the latter results in an unbalanced number of lists. The mean reading times for the target sentences are shown in Table 13. The standard error is shown in brackets.

**Table 13: Mean reading times for the target sentences**

Thematic role order in main verb	Referent in <i>because</i> clause	Pronoun's antecedent in main clause	Reading Time
SE	Stimulus	Subject	<b>1641 (74)</b>
		Non-subject	<b>2358 (138)</b>
	Experiencer	Subject	<b>2257 (136)</b>
		Non-subject	<b>1941 (91)</b>
ES	Stimulus	Subject	<b>2189 (137)</b>
		Non-subject	<b>1691 (78)</b>
	Experiencer	Subject	<b>1799 (78)</b>
		Non-subject	<b>2594 (155)</b>



Despite the apparent complexity of Table 13, the analyses of variance demonstrate clear effects. The effect of Antecedent Position was significant [ $F_1(1,63) = 17.853, p < 0.001$ ;  $F_2(1,30) = 9.411, p < 0.006$ ]. The effect of Subordinate Clause was significant [ $F_1(1,63) = 21.049, p < 0.001$ ;  $F_2(1,30) = 17.626, p < 0.001$ ]. The interaction Thematic Role Order X Subordinate Clause was marginally significant [ $F_1(1,63) = 3.297, p = 0.074$ ;  $F_2(1,30) = 3.862, p = 0.059$ ]. Additionally, the three-way interaction Thematic Role Order X Subordinate Clause X Antecedent Position was significant [ $F_1(1,63) = 36.179, p < 0.001$ ;  $F_2(1,30) = 189.718, p < 0.001$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 41 and 42.)

The three-way interaction shows a clear pattern in the mean reading times. As shown in Table 13, first considering the complex sentences with the SE thematic role order and referring to the Stimulus in the *because* clause, reading times for targets were faster when the pronoun referred to the subject (1641 msec) rather than to the non-subject (2358 msec), that is, to the Stimulus rather than the Experiencer. Considering the complex sentences with the SE thematic role order and referring to the Experiencer in the *because* clause, reading times for targets were faster when the pronoun referred to the non-subject (1941 msec) rather than to the subject (2257 msec), that is, to the Experiencer rather than the Stimulus. Now considering the complex sentences with the ES thematic role order and referring to the Stimulus in the *because* clause, reading times for targets were faster when the pronoun referred to the non-subject (1691 msec) rather than to the subject (2189 msec), that is, to the Stimulus rather than the Experiencer. Finally, considering the complex sentences with the ES thematic role order and referring to the Experiencer in the *because* clause, reading times for targets were faster

when the pronoun referred to the subject (1799mesc) rather than to the non-subject (2594 mesc), that is, to the Experiencer rather than the Stimulus.

Thus, Experiment 8 shows that targets containing a subject pronoun were read fastest when the antecedent was in the subordinate *because* clause, irrespective of how the referent is realised in the main clause. This clearly demonstrates that information in the subordinate clause is focused over that in the main clause. This contrasts with Suri and McCoy's (1994) proposal that the preferred antecedent of a subject pronoun in *SX because SY* complex sentences is the main clause subject.

## GENERAL DISCUSSION

This study attempted to investigate the effects of focusing in complex sentences. It has two parts. In the first, Experiments 4 and 5 investigated Kameyama's (1998) proposals. In the second, Experiments 6-8 investigated Suri and McCoy's (1994) proposals. These will be considered in turn.

In Experiment 4, the referent in the main clause of a complex sentence containing a *that*-complement was shown to be preferred as the referent of a subsequent pronoun rather than the referent in the subordinate complement clause. This supports Kameyama's proposal that the main clause is more prominent than the subordinate clause in complex sentences containing *that*-complements. It suggests that the utterance is the whole sentence, rather than it being treated as a sequence of separate utterances, with the focus being updated following each clause.

One problem with the interpretation of Experiment 4's results, however, is that the prominence of the referent in the main clause might have arisen because the

connective *then* signalled that the first mentioned referent as prominent, rather than because of any effect of the main clause. Results from Stevenson et al (2000) and Suri and McCoy (1994) (see also, Walker, 1993) suggest that *then* might have been directing attention in this manner in Experiment 4.

Experiment 5 attempted to replicate the results from Experiment 4, whilst ruling out the possible role of *then*. In Experiment 5, like in Experiment 4, the referent in the main clause of a complex sentence containing a *that*-complement was shown to be preferred as the referent of a subsequent pronoun rather than the referent in the subordinate complement clause. This thus supports the conclusion that the utterance is the whole sentence, rather than the focus being updated following each clause.

Kameyama proposed her extension of centering theory in order to combat some of its shortcomings with regards to how the focus is updated in complex sentences. As Kameyama (1998) notes, one problem with centering theory is that what counts as an utterance is critically left unspecified. This means that the framework cannot adequately account for how complex sentences are processed. It is unclear how referents are ranked according to grammatical function, since complex sentences have more than one clause, each with its own subject.

Kameyama's proposals have previously not been tested experimentally. And, indeed, the previous centering theory experiments testing the framework have typically concentrated on the distinction between the subject and the object(s) in simple sentences. The current results support Kameyama's extension to centering theory for these types of complex sentences: they demonstrate the effect of structural focusing on the processing of complement sentences, whereby the main

clause subject is focused over the complement clause subject. This suggests the ranking main clause subject > complement clause subject must be incorporated into the centering framework for dealing with complex sentences containing a *that*-complement.

A strategy for treating complex sentences within a centering framework was also proposed by Suri and McCoy (1994). Their proposals were investigated in Experiments 6-8. Experiment 6 showed that being either the Stimulus or the Experimenter in the main clause of a complex sentence containing a *because* clause had no effect on focusing in the sentence, and that nor did being either the subject or the non-subject. This null result is in line with the reading time experiment carried out previously by Cooreman and Sanford (1996). Cooreman and Sanford found that the referent in the main clause of a complex sentence was not focused over the referent in the clause subordinated with the causal connectives *because* and *since*. This contrasts with their finding the main clause referent was focused, rather than the subordinate clause referent, in complex sentences containing temporal connectives.

A number of possibilities were suggested as explanation of the result in Experiment 6. One explanation concerns the possibility that the focus on the Stimulus dissipates once the explanation entailment for how the Stimulus caused the state experienced is satisfied. A second explanation concerns the need for pre-tests in order to insure that texts are equally plausible. Experiments 7 and 8 attempted to satisfy these problems.

In Experiment 7, three sentence types were examined. In addition to implicit causality type sentences containing state verbs with referents occupying Stimulus

and Experiencer thematic roles, with either SE order or ES order, complex sentences were included which showed no implicit causality as a contrast. The results for Experiment 7 suggest that the subject antecedent and the object antecedent in the main clause of no implicit causality sentences were equally preferred as the subject of the following sentence. This contrasts with Suri and McCoy's proposal that the main clause subject is preferred. It corresponds with the previous result from McKoon et al (1993, Experiment 7), which found no difference in the accessibility of the two antecedents, using a probe task. In the state verb sentences, there was the suggestion of a recency effect in conjunction with a thematic role effect. This also contrasts with Suri and McCoy's proposal. The results suggest a focus on the antecedent in the Experiencer role, together with a competing focus on the most recent referent in the main clause.

Experiment 8 was based on Experiment 6. It was argued that the null result in Experiment 6 might be due either to the entailed explanation of how the Stimulus caused the state was fulfilled or to the texts differing plausibility. Experiment 8 ruled out the former possibility by including instances where the Experiencer was referred to in the *because* clause, not just instances where the Stimulus was referred to. Experiment 8 ruled out the latter possibility by matching texts for plausibility.

The results from Experiment 8 show that the preferred antecedent of a subject pronoun in *SX because SY* complex sentences is the subordinate clause subject, regardless of the potential antecedents are realised in the main clause. That is, the subordinate clause is focused. As Cooreman and Sanford argue, causal relations may be processed more deeply, eliminating main clause prominence. This is

supported by the finding that causally linked subordinate clauses processed more deeply than temporal subordinates (e.g. Townsend & Bever, 1978). This result thus suggests evidence against Suri and McCoy's proposal that the main clause subject in *because* sentences is preferred as the antecedent of a following subject pronoun.

Like Kameyama, Suri and McCoy proposed an extension of centering theory in order to combat some of its shortcomings with regards to how pronouns might be resolved following complex sentences, with the main clause subject or the subordinate clause subject. They concentrated on the specific type of complex sentence, those with the structure *SX because SY*. Suri and McCoy's proposals have previously received little experimental testing.

The finding from Experiment 8 suggest that *SX because SY* sentences are processed linearly with focus being updated after each clause. The focusing unit corresponds to the single clause, rather than the whole sentence. Hence, the referent in the final clause in the sentence is focused in such sentences, irrespective of whether the clause is main or subordinate. This effect prevails over the focusing effect of thematic role preferences.

It has previously been shown that semantic features may also impact on focusing in complex sentences. For instance, Coorman and Sanford observed contrasting results for causal and temporal connectives. Moreover, Stevenson et al (1994) found that the Stimulus was the preferred antecedent of a following subject pronoun, regardless of the grammatical role of the antecedent. A crucial difference between the current finding and Stevenson et al's observation, however, is that the former is in regard to complex sentences whereas the latter was for simple



sentences only. This contrast suggests that structural focusing overrides semantic focusing in this type of complex sentence.

The current result supports Kameyama's proposals regarding how such sentences are processed. Although she proposes that for complement sentences like those investigated in Experiments 5 and 6 the utterance unit corresponds to the whole sentence, Kameyama argues that tensed adjuncts, including the *because* sentences investigated in Experiment 8, are processed serially, one clause at a time.

One problem exists, though, with the comparison between the current results and those found in Experiment 7 where a focus on the Experiencer emerged. No definitive suggestions can be offered as to the precise conditions under which the Experiencer becomes focused. One obvious difference between the material investigated in Experiment 7 and those investigated in Experiment 8 is that in the main clauses of the former contained adverbs in order of them to be consistent with the no implicit causality materials. This factor may bring about a focus on the Experiencer, although no evidence can be offered in support of such a proposal as yet. Interestingly, the prominence of the Experiencer is in line with the intuitions of researchers of computational linguistics about the effect of (certain) perception statements on salience – the empathy effect, which in English typically manifests by making the Experiencer the focus of attention. This notion has received growing interest recently from some researchers of centering theory (see, for example, the references referred to in this paragraph), although these approaches have yet to be fully tested. Grosz and Sidner (1998) state that verbs of perception (which include state verbs) may impact upon the Cf ranking, suggesting a challenge to centering theory's proposals. These verbs exhibit properties similar

the notion of empathy in Japanese (first noted by Kameyama, 1985). (Empathy marks the entity which the speaker's perspective takes [Kuno, 1976].) Empathy is argued to affect the ranking of referents in Japanese (Kameyama, 1985, 1986; Walker, Iida & Cote, 1994). Turan (1995) proposes that empathy is also important to Western languages. Turan claims that the Experiencer is typically the object with perception verbs, and thus argues for the following general Cf ranking: empathy > subject > object(s) (corresponding with the ranking for Japanese proposed by Kameyama and Walker et al).

## CHAPTER 4 – EXPERIMENTS 9-18

## INTRODUCTION

A range of factors have been found to influence focusing. Some are these factors are structural, such as whether or not the referent is mentioned first or is the subject in the utterance (e.g. Gordon, Grosz & Gilliom, 1993). Other factors are semantic, such as whether or not a referent fills the thematic role associated with the consequences of the event described by the verb or whether or not a connective directs attention to the referent (Stevenson, Crawley & Kleinman, 1994; Stevenson, Knott, Oberlander & McDonald, 2000). Other referents in a discourse vary in their status in the world rather than their status in the discourse, and so could be described as pragmatic. One such feature is whether the referent is animate or inanimate. Animacy has been found to affect the choice of surface position of a referent in production (McDonald, Bock & Kelly, 1993) and the ease with which a referent can be recalled (Clark, 1965). In this chapter a series of ten experiments are described that aim to test the idea that animacy may effect the focusing of a discourse referent and so contribute to pronoun resolution. A second aim is to examine the relative contributions to focusing of all three kinds of factors, structural, semantic and pragmatic. The assumption underlying this aim is that focusing, and hence pronoun resolution, depends on multiple constraints that affect the prominence of a referent in a dynamic fashion as each new input is encountered (Stevenson, 1995; Stevenson and Urbanowicz, ms). That is, as the discourse unfolds, new input in the discourse exerts an influence on the prominence of the referents in the comprehender's mental model of the discourse and, in doing so, revises and updates the relative prominence of the referents. For

example, the first mentioned referent would initially be in focus. Then, when the verb is encountered, the thematic role associated with the endpoint of the described event is brought into focus. Depending on whether or not this thematic role is the first mentioned referent, this new focus will either reinforce or reduce the current focus on the first mentioned referent, thus updating the status of the referents in the mental model. The hypothesis, therefore, is that structural, semantic and pragmatic factors will each contribute to shifts in focus brought about as a result of their respective influences.

The original impetus for this study was the observation of a conflict between Sidner (1979) and Stevenson et al (1994) over which thematic role in transfer sentences is in focus. Sidner (1979) favours the Theme, whereas Stevenson et al favour the Goal. The attempt to resolve this conflict led to the first hypothesis about the effect of animacy on focusing. To highlight this conflict and motivate the first hypothesis, Sidner's (1979) model of focusing will first be reviewed, followed by a review Stevenson et al's study of thematic role focusing. An account of the conflict between the two models is offered in terms of animacy. This will be followed by a review of some of the studies that show effects of animacy on aspects of production, which lead to the proposal that animacy may have a comparable effect on focusing. Finally, structural focusing will be discussed. The effects of surface position on focusing and the possible influence of structural focusing in the current experiments will be considered.

### ***Discourse Focus and Actor Focus***

Sidner's (1979, 1983) focusing framework consists essentially of three algorithms, the Expected Focus Algorithm(s), the Focusing Algorithm(s), and the Pronoun

Interpretation Algorithm, together with two foci, the Discourse Focus and the Actor Focus. The Expected Focus Algorithm(s) predict the focus of the initial sentence in the discourse. The Focusing Algorithm(s) verify this prediction and track shifts in focus as the discourse progresses. The Pronoun Interpretation Algorithm uses focus information to resolve anaphoric expressions.

The Expected Focus Algorithm sets the Expected (Discourse) Focus and the Expected (Discourse) Focus List once, following the discourse-initial sentence. The Expected (Discourse) Focus is a prediction about what the discourse is ‘about’. The Discourse Focus was an attempt by Sidner to capture something like Reinhart’s (1981) sentence topic<sup>4</sup>. The Expected (Discourse) Focus List is a list of all other referents in the sentence and alternative candidates for the Discourse Focus. There is an analogous Expected Actor Focus Algorithm that sets the Expected Actor Focus and the Expected Actor Focus List. The Expected Actor Focus is set to the Agent of the sentences. The Actor Focus List, a subset of the Discourse Focus List, is a list of all other animate referents in the sentence and alternative candidates for the actor. The Expected (Discourse) Focus and Expected Actor Focus are used by the Pronoun Interpretation Algorithm for resolving anaphors in the second sentence. In subsequent sentences in the discourse, the Discourse Focus and the Actor Focus, together with their associated lists, are set by the Discourse Focusing Algorithm and the Actor Focusing Algorithm, respectively, to be used by the Pronoun Interpretation Algorithm in the remainder of the discourse.

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<sup>4</sup> Reinhart defines the sentence topic, which must be realized in the sentence, as the single entity

According to Sidner, syntactic and semantic information can be used by the Expected Focus Algorithm to set the Discourse Focus for the initial sentence in a discourse. Special syntactic constructions such as cleft, pseudo-cleft and *there*-insertion sentences mark the Discourse Focus. In the absence of these special marked forms the sentence's thematic structure determines the Discourse Focus. Sidner (1979) was one of the first to claim that some thematic roles are more focused than others. It is this claim that is focused on here.

Sidner proposes a strong preference for the referent filling the Theme role to be the Discourse Focus. The Pronoun Interpretation Algorithm first tests the Discourse Focus as the antecedent for a non-Agent pronoun in the adjacent sentence. Sidner (1983:284) uses text (21) to illustrate this.

- (21) (a) Mary took a nickel from her toy bank yesterday.  
(b) She put it on the table near Bob.

The preferred antecedent of the non-Agent pronoun *it* in (21b) is most likely to be *nickel*, filling the Theme role in the previous sentence, even though *toy bank*, filling the Source role, would also have been acceptable. The Discourse Focus List consists of all other referents in other thematic positions, with the referent filling the Agent role ranked last. Sidner (1983:285) claims that when no Theme is present there is a slight Goal bias or ranking by surface position, but that these are only weak preferences. This aspect of the theory is relatively unspecified, however. According to Sidner, the Agent is least preferred role as the Discourse

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about which the sentence predicates something about. The sentence topic is analogous to the notion of focus used here.

Focus. The Agent does, nonetheless, figure in pronoun resolution. Sidner proposes a second, separate focus mechanism for Agents. She proposes that the referent filling the Agent role is the Actor Focus, and the Actor Focus List consists of all other animate referents in the Discourse Focus List, which are potential actors. The Pronoun Interpretation Algorithm first tests the Actor Focus as the antecedent for an Agent pronoun.

To summarise Sidner claims, the Theme is the Discourse Focus and the preferred referent for a non-Agent pronoun, and that the Agent is the Actor Focus and the preferred referent for an Agent pronoun. The following section will briefly outline some of the psychological research on thematic role focusing and consider its relevance for assessing these claims.

### ***Thematic Role Focusing***

Research on thematic role focusing arose from earlier research showing that the interpretation of a pronoun in a *because* clause depends on the ‘implicit causality’ of the main verb (Caramazza, Grober, Garvey & Yates, 1977; Garvey & Caramazza, 1974; Garvey, Caramazza & Yates, 1976). Garvey and Caramazza (1974) argue that the instigator of an action is implicitly encoded with certain verbs, and it is the instigator that is focused. Garvey and Caramazza examined participants’ completions to sentence fragments such as (22) and (23).

(22)                John cheated Bill because he...

(23)                John punished Bill because he...

The pronoun was typically assigned to NP1 for some verbs, such as *cheat*. For example, *John* in (2) is seen as the instigator of the cheating. In contrast, the



pronoun was typically assigned to NP2 for other verbs, such as *punish*. For example *Bill* in (3) is seen as doing something to instigate the punishing. These biases for pronoun interpretation were also supported by Caramazza, Grober, Garvey and Yates (1977). They found that the antecedent of the pronoun in the *because* clause was named faster if the pronoun was consistent with the causality of the main verb than if it was not.

Subsequent research on verbs showing implicit causality has considered these biases in terms of thematic roles. In particular, different biases have been found with verbs associated with different thematic roles as their arguments (e.g. Au, 1986; Ehrlich, 1980; Stevenson, Crawley & Kleinman, 1994). When people write completions to sentence fragments containing transfer verbs and ending with *because* they typically mention the Goal (*Bill* in the example below) regardless of whether the Goal appears second in the sentence (e.g. *John passed the book to Bill because...*), or first in the sentence (e.g. *Bill took the book from John because...*). However, the preference for Goal is modified by an additional preference for the Agent<sup>5</sup>. That is, the Goal preference is stronger when the Goal is mentioned first, and hence is also an Agent, than when it is mentioned second (Stevenson et al).

The results described above suggest a less consistent picture of the impact of thematic roles on the focus than Sidner suggested. According to Sidner, the Agent is the preferred referent of an adjacent Agent pronoun. However, in transfer sentences containing *because* there seem to be two focused referents that compete

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<sup>5</sup> There are problems with this analysis of transfer verbs because it assumes that the subject of a transfer sentence has two thematic roles, Agent and either Goal or Source, depending on the order of the latter two roles. However, Jackendoff (1972) has argued that a NP in a single sentence can

with each other, the Goal and the Agent. Thus the evidence for the Actor Focus is limited, although it supports the general claim that Actor Focus List consists of the animate referents in the sentence, since the thematic role preferences found are always for animate referents. According to Sidner, the Discourse Focus is preferably the Theme, and is the preferred antecedent of an adjacent non-Agent pronoun. However, the Goal rather than Theme preference in transfer sentences is typically found, at least when subject anaphors are examined.

In summary, the findings generally support Sidner's view that some thematic roles are focused over others, but not her more specific claims. There is limited support for the claim that the Theme is the Discourse Focus. The Goal, rather than the Theme, in transfer sentences appears to be focused. Partially consistent with Sidner's Actor Focus, Stevenson et al did find a shift to the Agent with transfer sentences followed by a pronoun. All the results are, nonetheless, consistent with the claim that the Actor Focus List consists of animate referents. This suggests the possibility that animacy of the referent may influence focus in addition to thematic role biases.

### *Animacy*

Studies of production have long shown that animacy has a powerful influence on salience. Incremental theories of language production (e.g. Levelt, 1989) propose that a prominent referent has priority for subsequent mention. According to Bock and Warren (1985), this is because prominent referents are available early for

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bear more than one thematic role (see also Cowper, 1992).

processing, and so are assigned to the initial subject position (in English). As such, precedence in an utterance for a referent indicates its prominence (Bock, 1982).

The salience of animates has been shown to be an important feature when planning productions. Cooper and Ross (1975) show a preference for animate referents to precede inanimate ones in utterances. This preference for animates over inanimates may reflect a general bias for animates to be realised in the subject position of an utterance, rather than initial position, because they are typical or 'good' subjects and subjects tend to come first in English. Clark (1965), for instance, suggested that animate referents seem to have an affinity for subjecthood. Bock and Miller (1991) show that animate referents tend to be subjects, while inanimate referents tend to be assigned to other grammatical functions. Evidence that animates are prominent, rather than simply being preferred as subjects, comes from Byrne and Davidson (1985). They presented children with pairs of nonsense names representing the toy horses and carts that they were playing with (e.g., *Kal* for a horse, *Tep* for a cart), which they had to learn. When recalling the name pairs, the animate was more likely to be given before the inanimate, irrespective of the order in which the toys were presented and named. This suggests that animates are more prominent than inanimates. However, the animate precedence could simply be because horses tend to precede carts in the real world. Nonetheless, Byrne and Davidson's results suggest a general predisposition for animates to come before inanimates since this was the case in their study for both speakers of English, in which the subject is frequently first mentioned, and, importantly, speakers of Fijian, in which the subject is frequently last mentioned.

Prat-Sala and Branigan (2000) distinguish between an entity's prominence associated with intrinsic features, such as animacy, and prominence such as that derived from its particular realisation in a discourse. Using a picture description task, they found that both derived prominence (being most salient in a discourse<sup>6</sup> paired with a picture of the discourse referents) and inherent prominence (being animate) contributed to the choice of referent in participants' utterances. This suggests that animacy is of importance, but other features can have an influence together with animacy.

Thus, the production literature on syntactic processing suggests that animate referents are salient and are preferred for subsequent mention in the prominent initial subject position. In consideration of this suggestion, it is proposed to extend this to focusing and comprehension. It could be that the salience of an animate referent means that it is most accessible in a comprehender's discourse representation.

Generally, the focusing data concerning animacy is more consistent with an interpretation of Sidner's model whereby the Actor Focus and not the Discourse Focus is the most important element since the Actor Focus is animate and the preferences are always for animate referents. Sidner does state that the Actor Focus List is the set of animate referents in a sentence other than the Agent, and these are alternative candidates for the Actor Focus. Moreover, she argues that reference may be difficult to determine when there are two animate referents in

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<sup>6</sup> The salient entity was introduced first, was preceded by *There was this*, was preceded by an adjective and had multi properties predicated of it. The non-salient entity was introduced second and had no properties predicated of it.

the sentence, because there is not a strong preference for the Agent over the other actor(s) (Sidner, 1983:308-309). This does indicate that the important feature might be animacy rather than agency.

Researchers investigating thematic role focusing typically consider sentences containing only animate referents or do not consider references to inanimates. A number of studies contrasting thematic roles and animacy have, nonetheless, been carried out by Corrigan (1986; 1988; 1993). Corrigan (1988) gathered ratings of causality or consequences to sentences containing state and action verbs in which the arguments differed in animacy (e.g., *The book charms Paul*, where the Stimulus is inanimate). The main result was that causality was attributed to NP1 with NP1 verbs irrespective of the referents' animacy, whereas the implicit causality of NP2 verbs was moderated by the animacy of the referents. Corrigan (1993) also investigated the influence of animacy on the pattern of attributions. She found a shift in causal attributions with NP2 verbs away from NP2 to NP1 when the verb arguments had an Animate-Inanimate pattern. That is, causality was attributed to the animate referent rather than to the inanimate referent (the expected referent based on implicit causality). The effect of animacy was limited to NP2 verbs. With NP1 verbs and an Inanimate-Animate pattern there was no comparable shift to NP2 (the animate referent).

Corrigan's data show that animacy can have an effect in addition to thematic role focus, since animacy overrode implicit causality in NP2 verbs. The thematic role studies mentioned earlier also show that NP2 verbs describing actions are most susceptible to other focus effects, in this instance an Agent bias. The studies also suggest that animacy is of importance. For instance, all three referents mentioned

in the transfer sentences examined by Stevenson et al, the animate Goal and Source and the inanimate Theme, were available for reference. References to the Goal and Agent were preferred, and these were animate referents. Thus, it might be argued that focus can be conferred both from a referent's mode of realisation in a discourse, which is what studies of focusing have typically concentrated on, and from a referent's intrinsic features, such as animacy. This suggests an animate referent may be focused over inanimate ones, and that where referents are matched for animacy the focus may be dependent on their particular realisation in the discourse.

### ***Structural Focusing***

Among her less central claims, Sidner proposes an additional rule used in pronoun interpretation, the recency rule. Before assuming that a subject pronoun refers either to the Discourse Focus or the Actor Focus the Pronoun Interpretation Algorithm first implements the recency rule. The recency rule states that if the pronoun under consideration occurs in subject position, and there is a referent in the Discourse Focus List which occurs as the last constituent of the previous sentence, test that Discourse Focus List referent for co-specification before testing the Discourse Focus (or the Actor Focus). If that referent is acceptable both syntactically and inferentially, choose the Discourse Focus List referent as the co-specification of the pronoun. The operation of the recency rule means that a subject pronoun will preferably refer to the most recent referent in the preceding sentence rather than the Discourse Focus or the Actor Focus.

Studies using implicit causality sentences have found some evidence for recency. The study of complex sentences containing a *because* clause (Chapter 3,

Experiment 7) showed a recency effect in addition to a thematic role effect. A number of studies with implicit causality verbs with *because* find an implicit causality effect only with NP2 verbs, using a probe task (Greene & McKoon, 1994; McDonald & MacWhinney, 1995; McKoon, Greene & Radcliff, 1993; Stevenson, 1986) and using a corpus analysis of verbs as predictors of the subsequent mention of an implicit cause (Long & De Lay, 2000). This suggests a recency effect in conjunction with an implicit causality effect<sup>7</sup>.

Stevenson et al (1994) also found recency effects in their sentence continuation studies. However, recency only occurred when the continuation was a complete sentence and the fragment to be completed did not contain a pronoun. When presented with sentences such as *John passed the ball to Bill.* or *John took the ball from Bill.*, participants overall showed a tendency for referring to the recent referent as well as the Goal in completions. However, with a pronoun included in the fragment to be completed (e.g. *John passed the ball to Bill. He...*), a primacy effect accompanied the Goal preference.

The first mentioned referent rather than the most recent is regarded as salient by many researchers in sentence processing, due to it being the foundation for constructing an interpretation of the sentence (Gernsbacher, 1990; MacWhinney, 1977). Gernsbacher and Hargreaves (1988) argue that this foundational role in the representation of the sentence confers higher activation to the initial referent, which they call the 'first mention advantage'. Studies using a probe task to measure referents' activation indicate that the first mentioned referent is more

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<sup>7</sup> An alternative explanation of the probe studies might be that there was, in fact, no implicit

activated relative to the other referents in the sentence (Corbett & Chang, 1983; Gernsbacher, 1990; Gernsbacher & Hargreaves, 1988; Gernsbacher, Hargreaves & Beeman, 1989). Reading time studies agree with these findings. Reading times are faster for sentences containing a pronoun referring to the first mentioned, and subject referent than the second mentioned referent (Gordon & Chan, 1995; Gordon & Searce, 1995; Gordon et al, 1993; Hudson D’Zmura, 1988; Hudson, Tanenhaus & Dell, 1986; Hudson D’Zmura & Tanenhaus, 1998).

When considering the research on first mention effects described above, it is important to note that agency, subjecthood and first mention typically co-vary. Gernsbacher and Hargreaves (1988) did attempt to unravel these features, although not with sentences containing pronouns. They found that the first mentioned referent was most activated when comparing active and passive sentences (e.g. *Tina beat Lisa in a state tennis match.* vs. *Lisa was beaten by Tina in a state tennis match.*), using sentences containing two referents in a conjoined phrase (e.g. *Tina and Lisa argued during the morning.*), and using complex sentences with a fronted subordinate clause (e.g. *Because of Tina, Lisa was evicted from her apartment.*). Thus, she argued that first mention was the critical feature, not agency or subjecthood. Only one study has investigated first mention independent of subjecthood and agency using sentences containing pronouns. Gordon et al (1993, Experiment 5) used texts like (24) below.

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causality effect at all, only a recency effect (see Garnham, Traxler, Oakhill & Gernsbacher, 1996).



- (24) (a) Susan gave Fred a pet hamster.
- (b) In his opinion, she shouldn't have done that.
- (c<sub>1</sub>) She/Susan just assumed that anyone would love a hamster.
- (c<sub>2</sub>) He/Fred doesn't have anywhere to put a hamster cage.

They found that pronouns rather than repeated names were preferred when referring to both the referent in first mentioned position (24c<sub>2</sub>) and the referent in Agent and subject position (24c<sub>1</sub>), as measured by faster reading times, suggesting that both first mention and agency or subjecthood affect accessibility for pronominal reference.

Thus, the surface position effects are not clear-cut. The results discussed above generally suggest that the effect of recency on focusing is seen in sentences containing implicit causality verbs. But with continuation studies this is only when there is no pronoun in the fragment to be completed. A first mention effect is seen with a pronoun in the fragment to be completed. According to Sidner's recency rule, a subject pronoun is preferentially interpreted as referring to the most recent referent in the sentence, irrespective of the referent's thematic role. This notion of recency, however, is one of the most contested aspects of her theory, receiving only limited support. Carter (1987), who has given the most complete implementation of Sidner's framework, proposed a modification that eliminated the recency rule. Carter argues that Sidner's examples (1979:145) given to illustrate the need for the recency rule do not justify its inclusion. For example, Sidner uses the text (25) to support the idea of the recency rule.

- (25) (a) Mary is giving a surprise party at Hilda's house.
- (b) It's at 340 Cherry St.

Sidner claims that *It* refers to *Hilda's house*, and so the recency rule intervenes to prevent the Discourse Focus (*surprise party*) being first suggested as the referent. Carter, however, argues that, intuitively, “it is the party which is **at** 340 Cherry St; Hilda's house **is** 340 Cherry St.” (Carter, 1987:114, Footnote 13) [Carter's emphasis]. That is, *It* does actually refer to the Discourse Focus rather than the most recent referent. In Carter's implementation of Sidner's framework, the recency rule systematically led to poorer performance when resolving pronouns, than an implementation in which it is excluded.

As discussed above, a large number of studies show that the first mentioned referent is the preferred referent rather than the most recent. Typically, though, these studies investigate focusing in sentences that do not exhibit implicit causality. Recency effects are likely to be seen in sentences with implicit causality, although Stevenson et al show that the recency effect is confined to instances where no pronoun is given at the beginning of the sentence to be completed. Given these different findings, it is unsurprising that Sidner favoured recency whereas Carter did not. It may well be that the two researchers concentrated on different kinds of sentences.

Thus, there is some support for the recency rule in sentences exhibiting thematic role focusing. The aim of this paper is to investigate transfer sentences like Stevenson et al's, by systematically manipulating the animacy of each of the referents in the sentence. Previous research has shown that both semantic and structural factors can potentially contribute to focusing. The current study tests the hypothesis that animacy, an inherent feature of an entity, may also influence the accessibility of a referent for subsequent mention. The experiments described

below investigate the relative influences of thematic role, animacy and surface position on focusing. In line with Sidner's example (21a) containing a transfer sentence, the current experiments investigate single sentences with the null connective (the full stop). Stevenson et al found that a full stop behaves like the *because* connective with transfer sentences. Continuation tasks were used to examine which of the referents in transfer sentences were mentioned in the completions.

### **EXPERIMENTS 9-11: ONE ANIMATE REFERENT**

Experiments 9-11 examined transfer sentences based on those examined in Stevenson et al, but here the materials contained a single animate referent and two inanimate referents. The animacy hypothesis would predict that the single animate referent would be referred to in the continuation sentence, regardless of its thematic role or surface position. Stevenson et al's thematic role hypothesis would predict that the Goal would be the preferred referent in the continuations. Stevenson et al would also predict some effect of recency when no pronoun is included in the fragment to be completed. With regard to Sidner's predictions, Sidner claims that the Focusing Algorithms prefer the Theme as the Discourse Focus and the Agent as the Actor Focus (as noted above, a case could be made for arguing that the Agent corresponds to the first mentioned referent in both GS and SG role orders in the sentences), whereas the Pronoun Interpretation Algorithm prefers the most recent referent as the referent of a subject pronoun. Since in these materials there is no pronoun in the fragment to be completed, the Pronoun Interpretation Algorithm would not operate and so the recency rule would not be implemented. Thus, Sidner would predict that the Theme or the Agent would be

the preferred referent in the continuations. Interactions between factors are also possible, so that an animate referent that is also the Goal and most recent would be preferred.

As mentioned above, the materials used were based on the transfer sentences investigated by Stevenson et al (e.g. *John took the book from Bill*) which had two animates in first and third positions, corresponding to the Goal/Agent and the Source, and an inanimate in the Theme/second position. It is important to note at this point that in order for the GS versus SG manipulation to be investigated, in addition to the effect of animacy, the referents in Goal and Source positions must have Agent-like properties. Take, for example, the sentence *The hospital sent a letter to John.*, a sentence used in Experiment 11 which investigates sentences with two inanimates in first and second position and an animate in third position. In order for it be plausible for the first inanimate to be able to *send a letter to John*, it must have elements of Agency associated with it, in that the referent refers to an institution that is populated by animate beings. As such, the inanimates in first and third positions in the sentences investigated in this study had animate-like elements.

It is suggested that animacy is a conceptual property. For example, Clark and Begun (1971) propose a semantic hierarchy, following the finding that humans are most acceptable in the prominent subject position and non-human animates are less so, but are more acceptable than inanimates. They propose the following acceptability ranking: human nouns > animal nouns > concrete [inanimate] nouns > abstract concept nouns. Related to this is the finding that inanimates with

attributed humanness, in addition to animates, tend to appear early and as the subject in productions (McDonald, Bock & Kelly, 1993; Sridhar, 1988).

This suggests that acting under one's own volition rather than simply being human may be of importance in mediating a referent's salience. Also, the animate-like elements of inanimates may moderate any preference for the animate referent if these inanimates are also treated as animate in some way. As such, one might expect the following salience ranking for sentences such as *The hospital sent a letter to John*. investigated here: animate > animate-like inanimate > inanimate (that is, the ranking *John* > *hospital* > *letter* in the current example).

### ***Method***

The method used is the same for all of the experiments reported in this paper. In order to avoid repetition, the general method for all of the experiments is outlined. The difference between the experiments is the pattern of animacy of the three referents in the sentences used. The precise pattern of animacy in each experiment will be described in the relevant sections below.

### ***Participants***

Each experiment had 32 participants. Participants were undergraduate and postgraduate students from the University of Durham who volunteered. Participants were taken from the same population for each of the experiments reported in this chapter.

### *Materials and Design*

The materials for each experiment consisted of 16 transfer sentences, each mentioning three referents. The sentences were based on those used in Stevenson et al and had two different Thematic Role Orders. In the Goal-Source order the first referent filled the Goal role and the last referent filled the Source role (the GS order). In the Source-Goal order the first referent filled the Source role and the last referent filled the Goal role (the SG order). Unlike sentences in Stevenson et al, where the first and third referents were animate and the second referent inanimate, the materials systematically manipulated the pattern of animacy of the three referents. Sentences in Experiments 9-11 contained a single animate referent and two inanimate referents. The animate referent was the first mentioned referent in Experiment 9, the second mentioned referent in Experiment 10, and the third mentioned referent in Experiment 11, irrespective of the role it filled. The animate referent in Experiments 9-11 could thus occupy one of the three possible thematic roles, Goal, Theme, or Source. An example of materials for Experiments 9-11 is shown in Panel A of Table 14 below. Table 14 also shows an example of materials for the other experiments reported in this paper. These will be described in the relevant sections below. The full set of materials is shown in Appendix A.

The experiments had a repeated measures design on the factor Thematic Role Order (GS vs. SG). For each experiment, two lists were constructed. Each list consisted of eight sentences of one role order and eight sentences of the other role order. The sentences in GS order in list one were in SG order in list two; similarly, the sentences in SG order in list one were in GS order in list two. In each experiment, 16 filler items were included. These were materials from another of

the experiments, and tested other hypotheses about focusing and animacy. The design was the same for all the experiments reported in this chapter.

**Table 14: Examples of the materials used in Experiments 9-15**

Exp.	GS sentences	SG sentences
Panel A: One animate referent and two animate referents.		
9	Barbara bought a clock from the store.	Barbara returned the clock to the store.
10	The shop obtained Ann from the agency.	The shop returned Ann to the agency.
11	The hospital received a letter from John.	The hospital sent a letter to John
Panel B: Two animate referents and one inanimate referent.		
12	John collected Bill from the supermarket.	John sent Bill to the supermarket.
13	The club borrowed Peter from Jane.	The club loaned Peter to Jane.
Panel C: All animate referents or all inanimate referents.		
14	Robert collected Duncan from Bob.	Robert sent Duncan to Bob.
15	The club received a letter from the school.	The club sent a letter to the school.

*Procedure*

Participants usually carried out two experiments at the same time, the materials of one experiment acting as fillers for another. Each participant was presented with a booklet containing 32 sentences in total: 16 experimental sentences with a particular pattern of animacy of the referents, eight with the GS role order and eight with the SG role order; and 16 filler sentences with a different pattern of animacy of the referents, eight the GS role order and eight with the SG role order. Presentation order was randomised for each participant. For each sentence, participants were required to write a second sentence that continued the theme of the first. There was no time limit but participants were advised not to spend too

long on any sentence. The procedure was the same for all the experiments reported in this paper.

### ***Results and Discussion***

The surface subject of each continuation was examined to determine which of the potential antecedents was referred to. A judge determined whether the first, second or third referent was referred to, or whether the continuation was unclassifiable and not to be included in the analysis. A continuation was judged to be unclassifiable if the subject reference was ambiguous or a plural reference, or if the content was not a logical continuation to the text. As a reliability check, a sample of 25% of the scored completions in each experiment was presented to a second judge to check the degree of agreement. If disagreement was 10% or more, all continuations would be re-scored and the reliability check taken again. This situation did not arise in any of the experiments here. The continuations were scored in the same way for all the experiments.

In order to determine which of the three referents was mentioned significantly more often than would be expected by chance<sup>8</sup>, one-sample t-tests were used in the statistical analyses on the results. It was thought that whichever referent was mentioned significantly more often than chance was the preferred referent. The analysis of the results was the same for all the experiments reported in this paper. Because six t-tests were carried out on the data for each experiment, the alpha

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<sup>8</sup> With 4 possible response categories – reference to the first, second or third mentioned referent, or some other (unclassified) reference – chance level was estimated at 2 for each role order when treating participants as a random effect (8 items per condition divided by 4 response categories), and 4 for each role order when treating items as a random effect (16 subjects per condition divided by 4 response categories).



level was set at 0.008 throughout. Also, the predicted preferences were expected to be significantly above chance, hence 1-tailed tests were used. In the Results sections, only the results that are significantly above chance are reported. The rest can be found in Appendix B.

The mean number of references to each referent in each sentence version for the participants in Experiment 9, Experiment 10 and Experiment 11 are shown below, in Figure 9, Figure 10 and Figure 11, respectively.

Figure 9: Mean number of times each referent appeared as initial subject in continuations

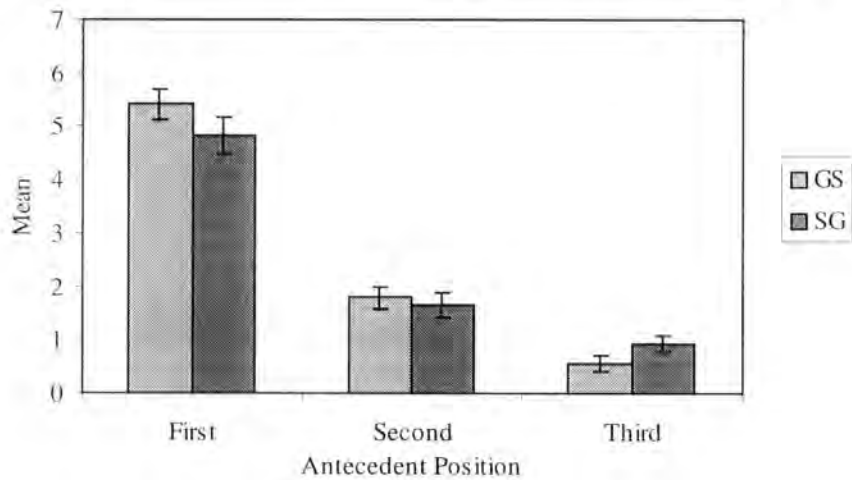


Figure 10: Mean number of times each referent appeared as initial subject in continuations

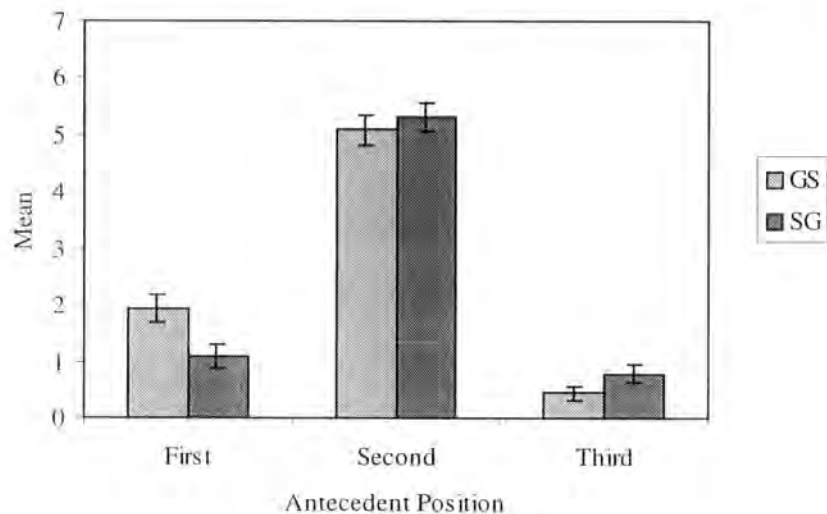
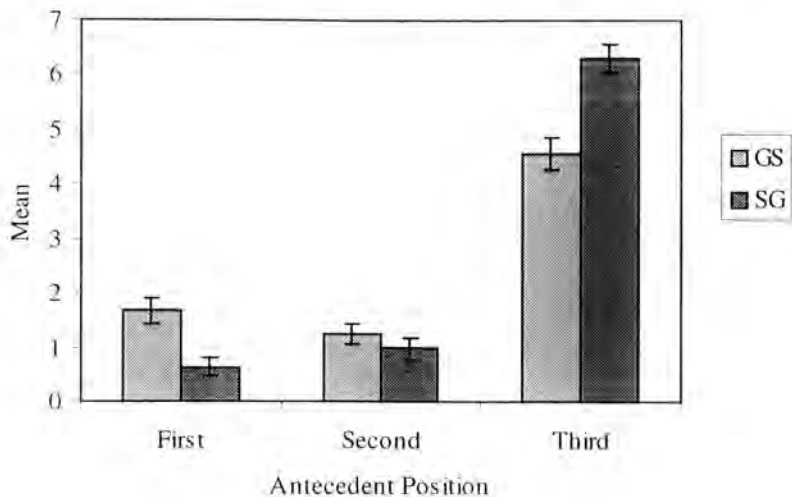


Figure 11: Mean number of times each referent appeared as initial subject in continuations



Inspection of the mean scores shows that participants predominantly referred to the animate referent, irrespective of thematic role and surface position. Statistical analyses confirmed these observations. In Experiment 9, the number of first mention references (the animate referent) was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 12.169,  $p < 0.001$ ;  $t$  [items] (15) = 9.241,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 8.455,  $p < 0.001$ ;  $t$  [items] (15) = 10.425,  $p < 0.001$ ). (For the  $t$ -tests see Appendix B, Tables 43 and 44.) In Experiment 10, the number of Theme references (the animate referent) was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 11.587,  $p < 0.001$ ;  $t$  [items] (15) = 10.557,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 12.758,  $p < 0.001$ ;  $t$  [items] (15) = 11.215,  $p < 0.001$ ). (For the  $t$ -tests see Appendix B, Tables 45 and 46.) In Experiment 11, the number of third mention references (the animate referent) was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 8.92,  $p < 0.001$ ;  $t$  [items] (16) = 6.445,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 16.609,  $p < 0.001$ ;  $t$

[items] (16) = 15.999,  $p < 0.001$ ). (For the t-tests see Appendix B, Tables 47 and 48.)

These results show that the animate referent was preferred, irrespective of the role it fills or surface position. When there is one animate referent and two inanimate referents, the feature of animacy takes precedence over both thematic role and surface position in focusing a referent. The result is in line with the animacy hypothesis that the single animate referent would be preferred. The result is not predicted by Sidner's account, which predicts instead that the Theme or the Agent be preferred. Nor is it predicted by Stevenson et al's account, which predicts a preference for the Goal. The Goal effect was found by Stevenson et al with sentences containing two animate referents, the Goal and the Source. It may be that the thematic roles have a stronger influence when animacy does not distinguish a single referent. Also, it is not known what the focus is when the Theme is one of the two animate referents. Experiments 12 and 13 examine participant's preferences when two animate referents were available, one being the Theme.

As mentioned above, it was necessary with the kinds of sentences investigated here that the inanimate referents in Goal and Source positions have Agent-like properties, and hence have elements of animacy associated with them. Any preference for the animate entity could be reduced if these inanimate entities were also treated as animate in some way. However, such a result did not happen in any of the experiments.

## EXPERIMENTS 12-13: TWO ANIMATE REFERENTS

Experiments 12 and 13 contained two animate referents and one inanimate referent. Since animacy does not distinguish one referent, the animacy hypothesis might predict that both of the two animates are equally likely to be preferred for subsequent mention. However, the work of Prat-Sala and Branigan (2000) suggests that in instances where two referents are matched for animacy, as is the case in the current materials, a referent's particular realisation in the discourse may contribute to the focus. Therefore, an alternative prediction might be an interaction between factors. That is, an animate referent that was also the Goal or the most recent referent would be preferred. Stevenson et al's thematic role hypothesis would predict that the Goal would be the preferred referent in the continuations, together with some effect of recency. Sidner would predict that either the Theme or the Agent would be the preferred referent in the continuations.

In Experiment 12, the first and second mentioned referents were animate. In Experiment 13, the second and third mentioned referents were animate. An example of materials for Experiments 12 and 13 is shown in Panel B of Table 14.

### ***Results and Discussion***

The scoring and the analysis of continuations were the same as used in the previous experiments. The mean number of references to each referent in each sentence version for Experiment 12 and Experiment 13 are shown below, in Figure 12 and Figure 13, respectively.

Figure 12: Mean number of times each referent appeared as initial subject in continuations

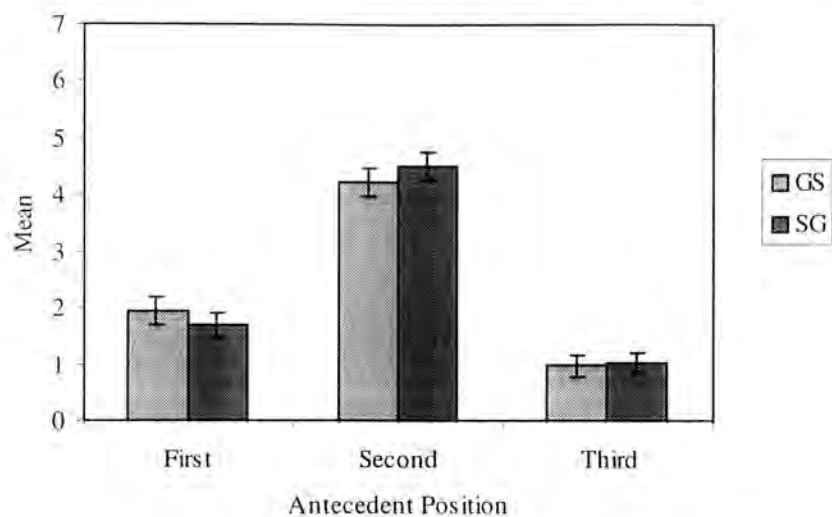
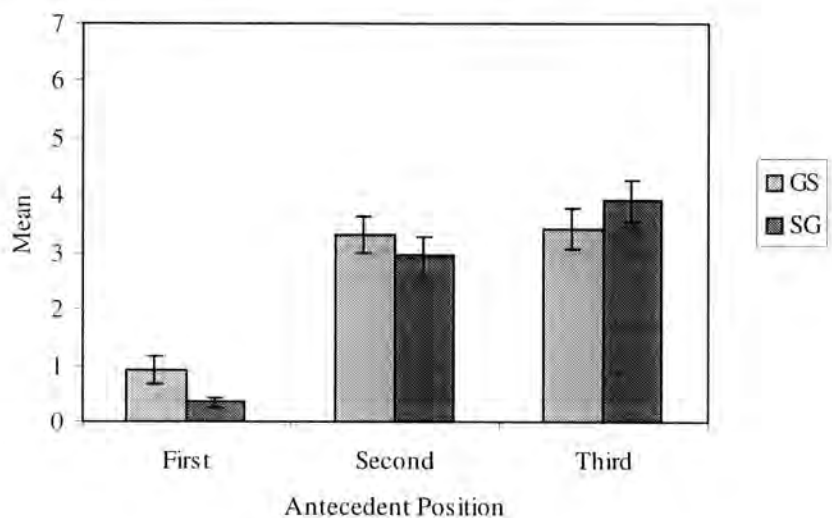


Figure 13: Mean number of times each referent appeared as initial subject in continuations

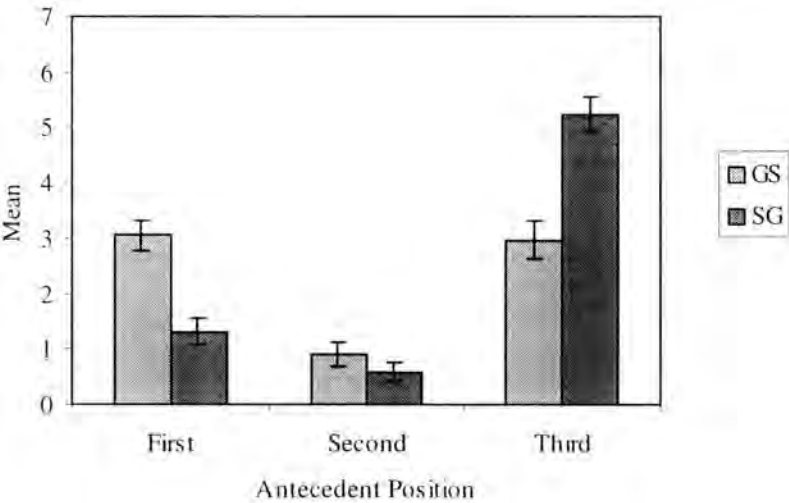


Inspection of the mean scores shows that participants predominantly referred to the Theme in Experiment 12, and to both the Theme and the third mentioned referent in Experiment 13. The statistical analyses confirmed these observations. In Experiment 12, the number of Theme references was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 8.508,  $p < 0.001$ ;  $t$  [items] (15) = 4.814,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 10.339,  $p < 0.001$ ;  $t$  [items] (15) = 5.13,  $p < 0.001$ ). (For the t-tests see Appendix B, Tables 49

and 50.) In Experiment 13, the number of Theme references was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 4.336,  $p < 0.001$ ;  $t$  [items] (15) = 4.072,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 2.925,  $p < 0.001$ ;  $t$  [items] (15) = 3.758,  $p = 0.001$ ). The number of third mention references was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 4.117,  $p < 0.001$ ;  $t$  [items] (15) = 5.428,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 5.334,  $p < 0.001$ ;  $t$  [items] (15) = 6.014,  $p < 0.001$ ). (For the  $t$ -tests see Appendix B, Tables 51 and 52.)

The data from Stevenson et al's (1994) study is included for comparison. The data were reanalysed to conform to the analyses of the present series of experiments. For reference, the results from Stevenson et al's experiment is shown in Figure 14.

**Figure 14: Mean number of times each referent appeared as initial subject in continuations**



The statistical analysis of the mean scores shows the number of Goal references was significantly greater than chance in both GS sentences, that is, the first mentioned referent ( $t$  [participants] (31) = 3.947,  $p < 0.001$ ;  $t$  [items] (15) = 3.782,  $p < 0.002$ ) and SG sentences, that is, the third mentioned referent ( $t$  [participants]

(31) = 11.169,  $p < 0.001$ ;  $t$  [items] (15) = 6.949,  $p < 0.001$ ). The number of third mention references was also significantly greater than chance for the GS sentences ( $t$  [participants] (31) = 2.752,  $p < 0.006$ ;  $t$  [items] (16) = 3.91,  $p < 0.001$ ). Thus, there was a preference for the Goal together with an additional effect of recency.

These results show that when there were two animate referents in the sentence and one filled the Theme role, then the Theme was preferred. If the other animate referent was the most recent referent, then it was also preferred. In Stevenson et al's experiment, the Goal and the most recent referent were preferred, both of which were animate. The result partially support the animacy hypothesis, which would explain the preference for the Theme whenever it was animate and the preference in Stevenson et al for Goal when both Goal and Source were animate. What it cannot account for is the additional presence of a recency effect in the two cases where the most recent referent was animate. These results are in line with a modified animacy hypothesis based on animacy interacting with the other factors present. This can account for the effect of both the Theme and recency preference when both referents were animate. To account for the recency effect, it is necessary to suppose that recency is confined to sentences in which the last mentioned referent is animate. These results partially confirm the expectations concerning thematic roles based on Sidner's work. There is no support for the Actor Focus. There is a preference for Theme, but only when the Theme is one of the two animate referents. As far as Stevenson et al are concerned, the Goal is only preferred above chance level when both Source and Goal are animate. Thus, the result suggests that the Theme is preferred when there is more than one animate referent in the sentence, one being the Theme, but that the Goal is preferred when the two protagonists are animate. Also, the most recent referent is

focused when animate. What is not known is what the focus is when all three referents are matched for animacy, that is, when referents are either all animate or all inanimate. Experiments 14 and 15 examine these situations, where animacy can have no effect.

## **EXPERIMENTS 14-15: ALL ANIMATE OR INANIMATE REFERENTS**

From the above discussion, one would expect either the Theme or the Goal and the most recent to be preferred in the all animate sentences. The all inanimate sentences allow one to make an estimate of the roles of semantic and structural factors in the absence of the inherent feature of animacy. In Experiment 14 all three referents were animate. In Experiment 15 all three referents were inanimate. An example of materials for Experiments 14 and 15 is shown in Panel C of Table 14.

### ***Results and Discussion***

The scoring and the analysis of continuations were same as used in the previous experiments. The mean number of references to each referent in each sentence version for Experiment 14 and Experiment 15 are shown below, in Figure 15 and Figure 16, respectively.



Figure 15: Mean number of times each referent appeared as initial subject in continuations

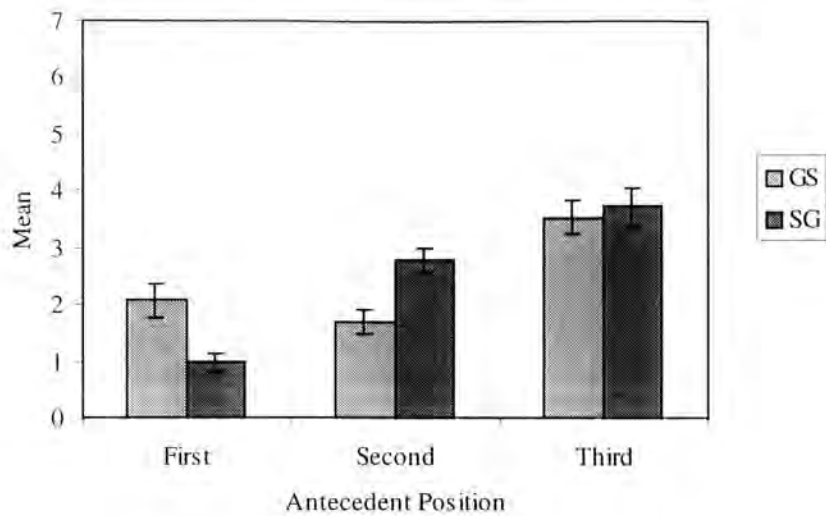
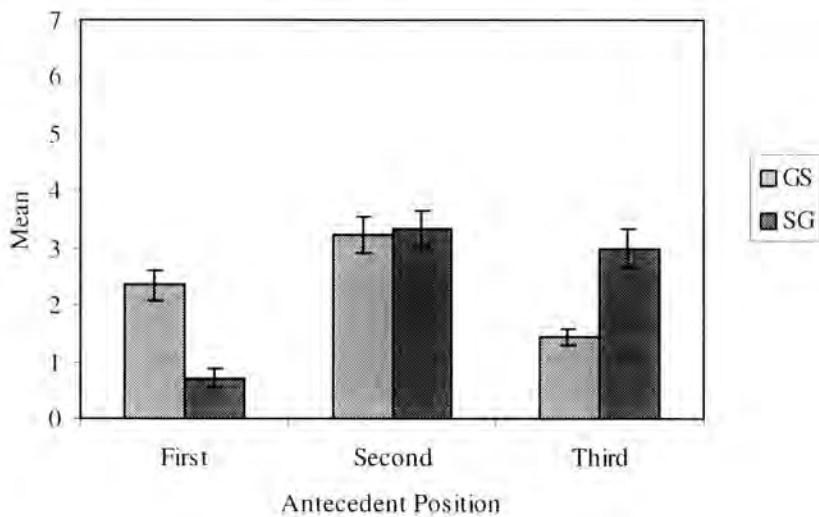


Figure 16: Mean number of times each referent appeared as initial subject in continuations



Inspection of the mean scores shows that when the referents were all animate, participants predominantly referred to the third mentioned referent. There is also the suggestion of a Theme effect in SG sentences, and a Goal effect in GS sentences. On the other hand, when the referents were all inanimate, the mean scores show that participants predominantly referred to the Theme, although there is, once again, also the suggestion of a Goal effect.

The main finding of a recency effect in all animate sentences was confirmed in Experiment 14, in GS sentences ( $t$  [participants] (31) = 5.029,  $p < 0.001$ ;  $t$  [items] (15) = 4.464,  $p < 0.001$ ) and in SG sentences ( $t$  [participants] (31) = 5.104,  $p < 0.001$ ;  $t$  [items] (15) = 6.111,  $p < 0.001$ ). The suggestion of a Theme effect in SG sentences was significant ( $t$  [participants] (31) = 3.571,  $p < 0.001$ ;  $t$  [items] (15) = 5.885,  $p < 0.001$ ). The number of Theme references in GS sentences was not above chance. The evidence for a Goal effect in GS sentences is weak since the number of Goal references did not differ from chance. However, it is also the case that the number of Source references in SG sentences was significantly below chance, which does suggest a tendency to prefer Goal to Source in first position. (For the  $t$ -tests see Appendix B, Tables 53 and 54.) The main finding of a Theme effect in all inanimate sentences was confirmed in Experiment 15, in GS sentences ( $t$  [participants] (31) = 3.937,  $p < 0.001$ ;  $t$  [items] (15) = 2.855,  $p < 0.007$ ) and in SG sentences ( $t$  [participants] (31),  $p < 0.001$ ;  $t$  [items] (15) = 3.009,  $p < 0.005$ ). The possibility of a Goal effect depends, in part, on the choice of Goal being above chance. This suggestion was not confirmed. The number of Goal references was not greater than chance in the GS sentences and failed to reach the required significance level of 0.008 across items ( $t$  [participants] (31) = 3.059,  $p < 0.003$ ;  $t$  [items] (15) = 2.169,  $p < 0.03$ ). However, it does seem to be the case that the choice of a Source referent is consistently lower than the choice of a Goal referent, lending some support to the suggestion of a Goal reference. The number of Source references was significantly below chance in SG sentences and significantly below chance in GS sentences in the participants analysis and not different from chance in the items analysis. (For the  $t$ -tests see Appendix B, Tables 55 and 56.)

These results show that when all three referents were animate the most recently mentioned was preferred, and that when all three referents were inanimate Theme was preferred. Thus, animacy has a clear-cut effect in that recency is favoured in all animate sentences and avoided in all inanimate sentences. Such a result is consistent with the previous findings, which showed a recency effect only when the most recent item was animate. The results of Experiment 14 also suggest that when a choice has to be made between three animate referents, recency is the strongest preference, since there was no overall preference for either Theme or Goal. Conversely, the results of Experiment 15 seem to suggest that when a choice has to be made between three inanimate referents, the Theme is the strongest preference, followed by a weaker effect of Goal.

Across the experiments as a whole, the strongest preference seems to be for a single animate referent (Experiments 9-11), with recency and Theme being the next strongest preferences, since they appeared together when both were animate in the IAA sentences of Experiment 12. Finally, the Goal preference only seems to appear when the Theme is inanimate, as in the AIA sentences of Stevenson et al (1994) and in the III sentences of Experiment 15. (The lack of any overall preference for Goal or Theme in the all animate sentences is difficult to interpret based on existing results, so these results will not be considered further.)

The results so far are all concerned with focusing. That is, it is the likelihood that each referent will be referred to first in the continuation that has been measured. However, what has not been examined is the preferred choice of referent for a subsequent pronoun. Such an examination is of particular interest with the materials used in Experiments 9-11, which contained one animate and two

inanimate referents. The animate referent was the preferred referent in the continuations of all three experiments. However, not know which of the two inanimate referents would be preferred in the absence of the focus on the animate referent. Experiments 16-18 examine which of the two inanimate referents would be the preferred referent of an inanimate pronoun in the fragment to be completed. These experiments, therefore, examine the effects of thematic role and surface position in the absence of animacy.

### **EXPERIMENTS 16-18: ONE ANIMATE REFERENT, FOLLOWED BY THE PRONOUN ‘IT’**

The results of Experiment 15 would have one expect a preference for the Theme whenever the Theme was one of the two inanimate referents. However, in the light of the previous results, one would not expect a recency effect when the third referent is inanimate. Stevenson et al (1994) found that when a pronoun was included in the fragment to be completed, a first mention effect occurred. Therefore, it is predicted that when the two inanimate referents are the first and third potential antecedents, then the first will be preferred above chance<sup>9</sup>.

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<sup>9</sup> With 3 possible response categories – reference to one of the two inanimate referents, or some other (unclassified) reference – chance level was estimated at 2.67 for each role order when treating participants as a random effect (8 items per condition divided by 3 response categories), and 5.34 for each role order when treating items as a random effect (16 subjects per condition divided by 3 response categories).

## ***Method***

### ***Materials and Design***

The materials in Experiments 16, 17, and 18 were identical to those used in Experiments 9, 10, and 11, respectively, except for the inclusion of a pronoun (e.g. *Barbara bought a clock from the store. It...*).

It might be argued that if some inanimates are interpreted as a collection of animate individuals (for example, *The head-office* is a substitute for *The collection of people working at the head-office*), then reference to them with the pronoun *They* might be more appropriate. However, using *They* as the inanimate pronoun following the sentence would not enable us to determine adequately which of the referents were being referred to because the plural pronoun might refer to all of the referents in the sentence. Thus *It* was used.

### ***Results and Discussion***

The scoring and the analysis of completions were same as used in the previous experiments, except that the pronominal referent was scored, not the first mentioned subject in the completion. In addition to completions judged to be ambiguous or not logical, completions where the pronoun referred to an event were marked as unclassifiable. The mean number of references to each referent in each sentence version for Experiment 16, Experiment 17 and Experiment 18 are shown below, in Figure 17, Figure 18 and Figure 19, respectively. Note that the new chance performance for participants was 2.67.

Figure 17: Mean number of times each referent was the referent of the pronoun

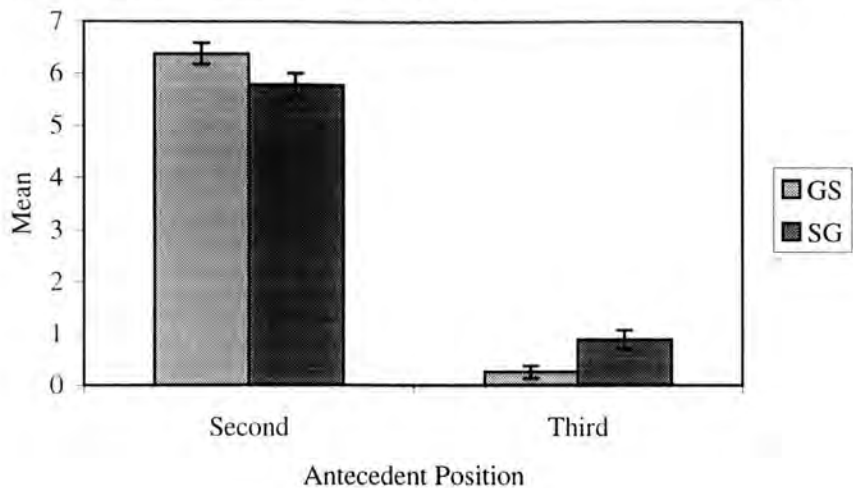


Figure 18: Mean number of times each referent was the referent of the pronoun

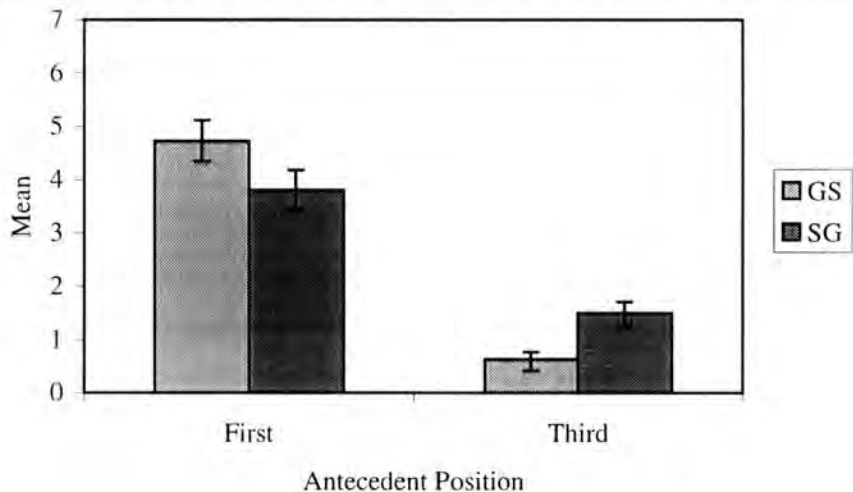
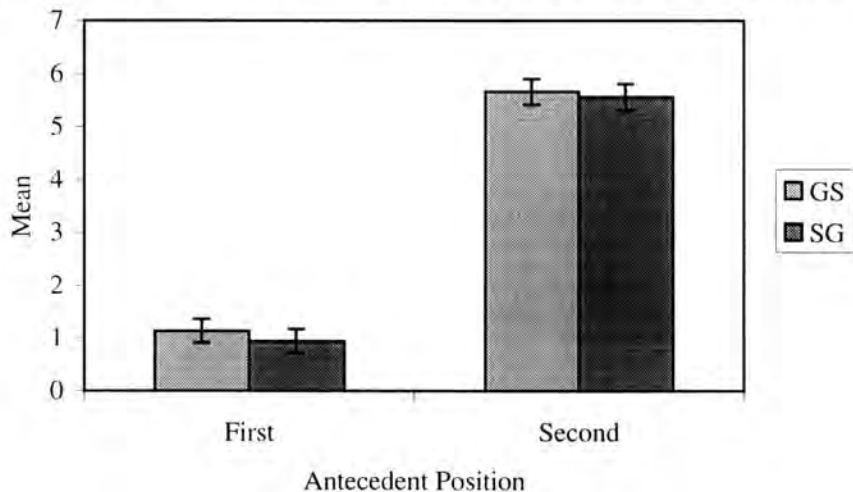


Figure 19: Mean number of times each referent was the referent of the pronoun



Inspection of the mean scores shows that participants predominantly referred to the Theme, when available (Experiments 16 and 18). When not available, there was a first mention effect (Experiment 17).

In Experiment 16, the number of Theme references was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 18.114,  $p < 0.001$ ;  $t$  [items] (15) = 11.098,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 14.223,  $p < 0.001$ ;  $t$  [items] (15) = 7.395,  $p < 0.001$ ). (For the  $t$ -tests see Appendix B, Tables 57 and 58.) In Experiment 18, the number of Theme references was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 12.434,  $p < 0.001$ ;  $t$  [items] (15) = 8.538,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 11.774,  $p < 0.001$ ;  $t$  [items] (15) = 7.228,  $p < 0.001$ ). (For the  $t$ -tests see Appendix B, Tables 59 and 60.) In Experiment 17, the number of first mention references was significantly greater than chance in both GS sentences ( $t$  [participants] (31) = 5.26,  $p < 0.001$ ;  $t$  [items] (15) = 10.045,  $p < 0.001$ ) and SG sentences ( $t$  [participants] (31) = 3.076,  $p < 0.003$ ;  $t$  [items] (15) = 4.301, ). (For the  $t$ -tests see Appendix B, Tables 61 and 62.) The results confirm the predictions made on the basis of the results of the earlier experiments in that the Theme was preferred. They also confirm the prediction that when neither inanimate referent was the Theme, then the first mentioned referent would be preferred. This prediction was based on Stevenson et al's (1994) observation of a primacy effect when a pronoun was included in the sentence fragment and a recency effect when there was no pronoun, together with a failure to find a recency effect when the third antecedent was inanimate in the earlier experiments in this chapter. The results support Stevenson et al's (1994) conclusion that the first mention effect is a bottom-up

strategy triggered by the pronoun – either a subject assignment strategy or a parallelism strategy.

It must be noted that a relatively large number of unclassifiable references were produced in Experiment 17, which had an animate Theme and inanimate Goal and Source. 33.4% of the total possible completions were unclassifiable. Only 11.7% of these completions judged unclassifiable were due to them being ambiguous or illogical continuations. Of all completions judged unclassifiable, 43.3% of them were references to the event described by the verb (e.g. [26]) and 45% of them were references to an inferred referent (e.g. *Paul's offence* in [27]). The large proportion of these types of completion could be seen as further indication of the strong preference for the Theme.

(26)                The court sent Paul to the prison. It...*“proved to be a fatal mistake.”*

(27)                The court sent Paul to the prison. It...*“was his third offence.”*

### ***Further Analysis***

Sidner argues that the Agent – the Actor Focus – is the preferred referent for an Agent pronoun. No Agent preference was found here. However, it is important to bear in mind that it is not known which anaphors were Agents and which were non-Agents in participants' continuations, since the thematic role of the anaphor was not examined. To investigate further the role of the Actor Focus, continuations were re-examined to assess whether an Agent antecedent is preferred when the anaphor is also an Agent. Based on Sidner's proposal that the Actor Focus is the preferred referent of an Agent pronoun (and not taking into account the recency rule, which was shown not to have an effect in Experiments



16-18), a general prediction would be that Agent anaphors in completions should typically refer to Agent antecedents. Since the first mentioned referent was always an Agent in the transfer sentences, the first mentioned references in completions (either pronoun or repeated name) were re-examined to determine whether they were also Agents.

Across Experiments 9-15, there were a total of 800 continuations in which the Agent (first mentioned) antecedent was referred to with an Agent subject. There were a total of 1,123 continuations in which the Agent antecedent was referred to with a non-Agent subject. It should be noted, however, that there were large differences across the experiments in the number of Agent antecedents referred to in continuations. The above totals make it hard to draw any strong conclusions, but the data does show that the Agent is not the preferred antecedent of an Agent anaphor.

As a further check of Sidner's claims, this time for the Actor Focus and the Discourse Focus, continuations were reanalysed a second time. This was motivated by consideration of the example shown in (1), which Sidner (1983) used to illustrate the Discourse Focus. It shows the Agent as the preferred antecedent for an Agent pronoun in subject position, but it also shows the Theme as the preferred antecedent for a non-Agent pronoun in non-subject position. Support for a Theme preference might come from an examination of non-subject anaphors. The results reported in the previous sections are only for subject anaphors. However, it is possible to reanalyse the continuations to test the possibility, that there is some affinity for an Agent–Theme anaphor pattern, realised as subject anaphor and non-subject anaphor, respectively. To investigate

this, all continuations made in which the Agent antecedent was referred to as the subject were re-examined to determine whether they contained a second anaphor in non-subject position that referred to the Theme antecedent. Of those that fell into this category, they were scored as to whether the subject anaphor was an Agent or not.

Across Experiments 9-15, there was a total of 449 continuations referring to the Theme antecedent with a non-subject anaphor in which the Agent antecedent was referred to with an Agent subject. Conversely, there was a total of 285 continuations referring to the Theme antecedent with a non-subject anaphor in which the Agent antecedent was referred to with a non-Agent subject. It should be noted, however, that there were large differences across the experiments in the number of continuations in this subset. The above totals make it hard to draw any strong conclusion, but the data does show that there is some affinity for an Agent–Theme anaphor pattern.

It must be noted that these preferences do not bear upon the observed focusing preferences, but are simply descriptive, showing the preferences for the particular instances when a particular antecedent is actually referred to.

## **GENERAL DISCUSSION**

This study suggests a more complex view of focusing than envisaged by Sidner or suggested by Stevenson et al's results, both of which emphasise the role of thematic role preferences in determining focusing. Sidner proposed two foci, the Theme and the Agent. The Theme is the Discourse Focus and is the preferred referent for non-Agent pronouns. The Agent is the Actor Focus and is the

preferred referent for Agent pronouns. This contrasts with Stevenson et al's proposal. According to Stevenson et al's thematic role focusing hypothesis, the referent occupying the Goal role is focused, in combination with either a primacy or recency effect depending on whether a pronoun was present or absent in the fragment. The study demonstrates the effects of two kinds of focusing; focusing from how a referent is realised in the discourse, that is, thematic role and surface position, and focusing from the inherent features of a referent, that is, animacy. Thus, both Sidner's and Stevenson et al's proposals are not complete as they stand, since they do not account for the effects of animacy on focusing. The current study shows that the pattern of animacy of the referents in a sentence determines what other focusing effects will be seen.

The experiments examining sentences containing a single animate referent demonstrate that the strongest preference seems to be for a single animate referent. Here, the focusing effect of animacy takes precedence over the other available factors. This suggests a clear modification of the preferences proposed by Sidner and Stevenson et al, whereby the pattern of animacy determines the focusing effects of the other features present. The effects of thematic role and surface position are seen, but only when there is no single animate referent. Theme and Recency are the next strongest preferences, although animacy has a clear-cut effect on recency in that recency is favoured only when the most recent referent was animate. Finally, the Goal preference only seems to appear when the Theme is inanimate, as in the AIA sentences of Stevenson et al (1994) and in the III sentences of Experiment 15.

Previous research investigating thematic role preferences has suggested that the features of a referent acting in the event can also influence focusing. For instance, the nature of the object transferred (Oakhill & Garnham, unpublished) and an actor's social status (Garvey & Caramazza, 1974) can affect the perceived instigator of the event. The current study extends this with the finding that animacy has a crucial role in focusing a referent. The focus on a single animate referent is in line with the production literature on syntactic processing which suggests that animacy confers salience to an animate entity (e.g. Cooper & Ross, 1975). The current study suggests extending this to focusing and comprehension, arguing that animacy is an important feature in determining the accessibility of discourse referents in a comprehender's discourse representation. Bock and Warren (1985) argue that the conceptual accessibility of an entity makes it become available early to the grammatical encoder when planning a production. Animacy is thought to affect an entities conceptual accessibility (Bock, Loebell & Morey, 1992; Bock & Warren, 1985; McDonald, Bock & Kelly, 1993). It may be easier to integrate the relations among participants around an animate referent when constructing a representation, since it provides perspective (MacWhinney, 1977); a single animate referent is focused because the representation is built around what is happening to the referent.

The effect of animacy is generally consistent with an interpretation of Sidner's model whereby the Actor Focus is animate. However, this removes the special status Sidner assigned to the Agent. Contrasting with Sidner's proposal that the Agent is focused and the preferred referent of an Agent pronoun, there was no support for the Agent as the Actor Focus. The Agent was not preferred as the subject in continuations in any of the sentences examined. A re-examination of the

continuations also revealed an Agent anaphor was not preferentially used to refer to the Agent, although there was a preference for an Agent anaphor in the sub-set of the continuations where the Theme was also referred to as the non-subject.

Despite the predominance of the animacy effect, the effects of thematic role and surface position on focusing are, nevertheless, seen when there is no privileged animate referent competing for the focus. First considering thematic roles, although Sidner's notion of the Actor Focus was not supported, there is strong support from this study for Sidner's notion of the Theme as the Discourse Focus. The experiments show that the Theme is focused, irrespective of its animacy, when there is not exactly one animate entity in the sentence. The one exception to the general focus on the Theme, that is, the Theme preference in all animate sentences was restricted to the SG sentences, not reaching significance in the GS sentences. It could be argued that participants adopt a specific strategy with sentences with all animates, since they are highly untypical.

A Theme focus has previously received little experimental support. Previous studies investigating transfer sentences, including Stevenson et al, suggest that the Goal, and not the Theme, is focused. The current study, however, suggests that the lack of support for the Theme may be due to the types of materials that have been examined previously. Experiments showing the Goal focus have been restricted to examining sentences with animate Goal and Source and inanimate Theme, whereas the current study shows that other patterns of animacy without a single animate referent demonstrate a Theme preference. The current study thus extends previous results, suggesting that the Goal effect is overridden by a focus on the Theme in instances without the AIA pattern of animacy. Despite the lack of

support for Stevenson et al's proposal, there was, nonetheless, the some suggestion of a Goal effect in sentences with the III pattern of animacy, although it is not to the level of the AIA sentences. Thus, it seems that the Goal only becomes focused when the Theme is inanimate.

In addition to a Theme preference, an effect of surface position was also found. Sidner proposes a recency rule that the most recent referent is the preferred referent of a subject pronoun. In the current study, the recency rule is only applicable in the experiments where a pronoun was included in the fragment to be completed (see below). Stevenson et al also suggest that recency has an effect, but in instances with no pronoun included. They found a focus on the most recent referent competing with the Goal focus. The current study also shows a recency effect with no pronoun, together with the Theme effect. However, this is restricted to instances where the most recent referent was animate. No recency effect was found when the most recent referent was inanimate. The recency effect when the most recent referent is animate in addition to the other effects of focus is in line with Stevenson et al, which also found a recency effect when the most recent referent was animate. It is not expected from Sidner's view of recency as no pronoun was included.

The notion of recency has received only limited support, and is one of the most contested aspects of Sidner's theory (see Carter, 1987). A large number of studies show that the first rather than the most recent mentioned referent is prominent (e.g. Gernsbacher et al, 1989). Typically, though, these studies investigate focusing in sentences that do not exhibit implicit causality. Recency effects are found in sentences with implicit causality (e.g. Greene & McKoon, 1994),

although Stevenson et al show that the recency effect is confined to instances where no pronoun is given at the beginning of the sentence to be completed. A contrasting first mention effect is typically seen when investigating preferred pronominal reference (e.g. Gordon et al, 1993; Stevenson et al). Despite these differences, all of the previous research critically mentioned examined sentences with animate referents. The current study extends previous results, suggesting limits for the recency effect: the effect of recency depends on the most recent referent being animate, in addition to there being no pronoun.

As well as investigating focusing effects on production, the interpretation of a pronoun was investigated. This was of particular interest for sentences containing a single animate referent and in relation to Sidner's recency rule. Restricting reference to the animate referent, by including an inanimate pronoun, enabled the assessment of preferences for the pronominal referent in the absence of the focus on the animate referent. It also enabled the further assessment of Sidner's proposals. According to Sidner, the preferred pronominal referent would be the recent referent if available, if not, the Theme. Additionally, it enabled a contrast with Stevenson et al's proposal of a first mention effect when a pronoun is included.

When available, the Theme was preferred, not the most recent referent. This is further support for Sidner's notion of the Theme as the Discourse Focus. It is the case for pronoun interpretation as well as focusing. When the Theme was not available, the first mentioned referent was preferred, not the most recent referent. The first mention effect consistent with Stevenson et al's observation that first mention effects occurred only with pronouns, suggesting that the pronoun itself

may constrain the preferred pronominal referent when the Theme is unavailable for reference. Sidner's recency rule was not supported. This is in line with Carter's (1987) implementation of Sidner's framework, where inclusion of the rule led to poorer performance when resolving pronouns.

All in all, the results correspond to the notion that the focus depends on the precise range of features present in the sentence. They are consistent with an activation based account in which convergence and competition among the constraints present in the discourse determine the activation of the referents in the discourse representation (e.g. Bates & MacWhinney, 1989; Gernsbacher, 1989). It is argued that numerous factors in the discourse, syntactic, semantic, and pragmatic, can influence activation. These are used by the comprehender, unconsciously, to compute the ranking of referents. Higher activation makes a referent more accessible to the comprehender for use in subsequent productions. The results suggest weightings for the cues present in the transfer sentences used in the materials. A single animate referent has strong weighting, which overrides the contributions of thematic role and surface position. This suggests a clear modification of the preferences proposed by Sidner and Stevenson et al. The effects of thematic role and surface position are seen, but only when there is no single animate referent. When there is not exactly one animate referent the Theme becomes most activated, irrespective of whether or not it is animate, together with the most recent referent, but only if the referent is animate. It may be that the Goal is also activated, but the magnitude depends on the other influences present. It seems that its activation is only significant when the Theme is inanimate.



In summary, three different factors affect the focus in transfer sentences: animacy, thematic roles and surface position, but it is concluded that animacy takes precedence over thematic role focusing and surface position. It may be that an event's representation is built around what is happening to the animate referent, maybe because it is simply easier to integrate information around the perspective of an animate rather than inanimate referent. Thematic role and surface position effects were seen where there was no single animate referent, with a focus on the Theme and a recency effect. The general Theme focus was not mediated by animacy, although the Goal focus has previously been found when the Theme is inanimate and Goal and Source are animate. The recency effect is dependent on the referent being animate. In addition to the Theme focus, the Theme was also the preferred pronominal referent, with a first mention effect if the Theme was unavailable. The results may help develop an activation based model of anaphor resolution by indicating the relative weights for animacy, thematic roles and surface position cues, and indicate the circumstances under which these effects will be found.

The animacy effect extends the research in the production literature on syntactic processing showing that animacy confers salience to focusing and comprehension. It also shows that the previous findings of a Goal effect are due to the effects of animacy. Previous studies have been restricted to examining the AIA pattern of animacy. The current study thus extends previous results, suggesting that the Goal effect is overridden by a focus on the Theme in instances without a single animate referent. It also extends the previous finding concerning surface position effects. Recency effects have been found in sentences with implicit causality. The current study shows animacy has a clear-cut effect on recency in that recency is favoured

only when the most recent referent was animate and there is no pronoun. Sentences with a pronoun further support the Theme preference in the absence of animacy effects and, when the Theme is not available, that the notion that the pronoun itself may constrain the first mentioned referent as the preferred pronominal referent.

## **CHAPTER 5 – EXPERIMENTS 19-21**

## INTRODUCTION

According to centering theory (Grosz, Joshi & Weinstein, 1983, 1995), the subject and first mentioned referent is focused. A pronoun is read faster than a repeated name anaphor (called the repeated name penalty) when it refers to the focused antecedent but not to other antecedents. According to parallelism (e.g. Stevenson, Nelson & Stenning, 1995), however, pronoun resolution is facilitated when the pronoun occupies the same grammatical role as its antecedent. This is the case for both subject and non-subject antecedents. Recently, Chambers and Smyth (1998) have shown a repeated name penalty also occurs for both subject and non-subject anaphors, as long as the anaphor and antecedent are grammatically parallel and contained in structurally congruent sentences. This poses problems for centering theory, which does not predict a repeated name penalty here for non-subject anaphors.

Three experiments are described that further examine parallelism by testing for the presence of a repeated noun phrase penalty with subject and non-subject anaphors that referred to inanimate referents. The study additionally investigates the impact of sentence voice (active versus passive constructions) on marking the subject referent as salient. In the following sections, the claims from centering theory as regards pronominalisation are reviewed. Discussed are studies specifically investigating centering theory's pronominalisation rule and the claim that an utterance has only a single site where a pronoun can increase coherence. Then follows a review of studies of parallelism, which have implications for

pronoun interpretation not accounted for by centering theory. That is, that a sentence may have more than one site for increasing coherence, as long as pronouns and antecedents are in parallel adjacent sentences. This is followed by proposed extensions by Suri and McCoy (1994) and Kameyama (1986) of centering theory that encompass a parallelism constraint in order to account for the findings. Finally, attention is turned to the effect of the passive voice in marking the subject as most salient, and how this emphasis may influence interpretation.

### *Centering Theory*

Centering theory (Grosz et al, 1983, 1995) proposes that each utterance ( $U_n$ ) introduces a set of forward-looking centers (Cf) corresponding to the discourse referents. The Cf is ranked according to the prominence of the referents. The Cf contains two privileged elements, the backward looking center (Cb) and the preferred center (Cp). Each utterance has a Cb (except discourse segment initial utterances), which is what the utterance is 'about' and connects the current utterance with the previous. The Cp is the most highly ranked referent in the Cf and is a prediction about the Cb in the following utterance. The factors affecting ranking in the Cf have not yet fully determined, but the structural features of subjecthood and first mention contribute (e.g. Gordon, Grosz & Gilliom, 1993).

The theory's proposals are formulated in terms of constraints and rules concerning the Cf and Cb. These specify the coherence between adjacent utterances in a discourse. The constraints and rules (based on Grosz et al, 1986; Brennan, Friedman & Pollard, 1987) entail that: There is not more than one Cb per utterance; The  $Cb(U_n)$  is the highest ranked element of  $Cf(U_{n-1})$  that is realised in

$U_n$ ; The  $Cb(U_n)$  should be realised as a pronoun if any element of  $Cf(U_{n-1})$  is realised as a pronoun in  $U_n$  (Strong Version: If the  $Cb[U_n] = Cb[U_{n-1}]$ , a pronoun should be used).

A body of studies suggests evidence supporting the centering theory's claims. Faster reading times are found for sentences containing a pronoun referring to a subject/first mentioned antecedent rather than a non-subject/second mentioned antecedent, and a pronoun is read faster than a repeated name – coined the repeated name penalty (Gordon et al, 1993) – when referring to this antecedent (Gordon & Chan, 1995; Gordon et al, 1993; Gordon & Searce, 1995; Hudson-D'Zmura, 1988; Hudson, Tanenhaus & Dell, 1986; Hudson-D'Zmura & Tanenhaus, 1998).

Of specific concern is the rule for pronominalisation of the  $Cb$ . The notion that an utterance has a unique  $Cb$  that should be referred to with a pronoun rather than a NP has been investigated experimentally by Hudson-D'Zmura (1988; Hudson, Tanenhaus & Dell, 1986; Hudson-D'Zmura & Tanenhaus, 1998) and Gordon et al (1993). Because it is felicitous to realise the  $Cb$  with a pronoun, these researchers argue that the repeated name penalty is diagnostic of the  $Cb(U_n)$ .

Hudson, Tanenhaus and Dell (1986) (See also Hudson-D'Zmura, 1988; Hudson-D'Zmura & Tanenhaus, 1998.) argued that the subject referent is the default interpretation of a following pronoun. In their study, participants were presented with two-sentence texts (e.g. 28), consisting of a context sentence followed by a target sentence which had one of four possible versions.

- (28) (a) Jack apologized profusely to Josh.
- (b<sub>1</sub>) He/Jack had been rude to Josh yesterday.
- (b<sub>2</sub>) He/Josh had been offended by Jack's comment.

The target sentence contained an anaphor that referred either to the subject referent (28b<sub>1</sub>), the Cp(U<sub>n-1</sub>), or the non-subject referent (28b<sub>2</sub>). The anaphor could be either a pronoun or a repeated name. Results show that sentences referring to a subject antecedent were read faster and judged more coherent when the referring expression was a pronoun. By contrast, sentences referring to a non-subject antecedent were read faster and judged more coherent when the referring expression was a repeated name.

Hudson-D'Zmura et al (1986; Hudson-D'Zmura, 1988; Hudson-D'Zmura & Tanenhaus 1998) argued that these results are due the prominence of the subject referent making it the default interpretation of a pronoun. Processing is impaired with pronominal references to non-subjects because the antecedent is primarily mis-assigned as the subject. A problem with this analysis, however, is that subject antecedents and anaphors were parallel whereas non-subjects were non-parallel. A bias for pronouns to be resolved with parallel antecedents would also give the same results. In order to distinguish between the alternative explanations, the interpretation of non-subject pronouns must be considered

Gordon et al (1993, Experiment 1) also investigated the rule for pronominalisation of the Cb, but using sentences containing non-subject anaphors as well as subject anaphors, where both anaphors had the same (parallel) grammatical role as their antecedents. Their participants were presented with four-sentence texts that had three possible versions (e.g. 29-31), manipulating the type of the anaphors. In the

Name-Name version (29) anaphoric references to both the subject and the non-subject referent were always repeated names. In the Pro-Name version (30) anaphoric references to the subject referent were always pronouns whereas references to the non-subject referent were always all repeated names. In the Pro-Pro version (31) anaphoric references to both the subject and the non-subject referent were always pronouns.

- (29) (a) Bruno was the bully of the neighborhood. [Name-Name]  
 (b) Bruno chased Tommy all the way home from school one day.  
 (c) Bruno watched Tommy hide behind a big tree and start to cry.  
 (d) Bruno yelled at Tommy so loudly that all the neighbors came outside.
- (30) (a) Bruno was the bully of the neighborhood. [Pro-Name]  
 (b) He chased Tommy all the way home from school one day.  
 (c) He watched Tommy hide behind a big tree and start to cry.  
 (d) He yelled at Tommy so loudly that all the neighbors came outside.
- (31) (a) Bruno was the bully of the neighborhood. [Pro-Pro]  
 (b) He chased Tommy all the way home from school one day.  
 (c) He watched him hide behind a big tree and start to cry.  
 (d) He yelled at him so loudly that all the neighbors came outside.

Reading times for target sentences (29d; 30d; 31d) were collected. Results show that sentences in the Pro-Pro and the Pro-Name versions were read equally fast, but sentences were read slower in the Name-Name version. That is, there was a repeated name penalty for references to the subject antecedent, as shown by the difference between Pro-Pro and Name-Name or Pro-Name and Name-Name, but not for references to the non-subject antecedent, as shown by a difference between Pro-Pro and the Pro-Name.



The results support the notion that the subject is prominent and that it is felicitous to use a pronoun rather than a repeated name when referring to it anaphorically in an adjacent utterance. Moreover, the results suggest that the effect of pronominalisation on increasing coherence is limited to this referent, supporting the notion that there is one unique Cb per utterance. Centering theory states that the Cb is the coherence link to the previous utterance. According to Gordon et al, pronominalisation of the Cb promotes coherence because finding a pronoun's referent involves relating it to the previous discourse, thus providing a strong link back to the previous utterance.

### ***Parallelism***

Often confused with the bias for pronouns to have subject referents is the parallelism effect. The parallel function strategy was first proposed by Sheldon (1974) to account for children's understanding of pronouns in relative clauses. She argued that if anaphors have the same grammatical role as their antecedents in the preceding clause, then the sentence would be easier to interpret than if they have different grammatical roles. She also suggested that this strategy might also account for the comprehension of pronouns by adults. The effect of parallelism on pronoun interpretation is illustrated in (32) and (33).

(32)            John hit Bill and then he ran away.

(33)            John hit Bill and then Mary kicked him.

The subject pronoun in (32) is preferentially interpreted as referring to *John*, the subject referent, whereas the non-subject pronoun in (33) is preferentially interpreted as referring to *Bill*, the non-subject referent. Experimental support for

the parallelism strategy in pronoun interpretation was later proposed by other researchers (e.g. Corbett and Chang, 1983; Grober, Breadsley & Caramazza, 1978). Grober et al investigated participants' completions to sentence fragments such as (34), which contained a main clause containing two potential antecedents followed by a *because* clause containing a subject pronoun.

(34)                    John may scold Bill because he...

They found, among other results, that the subject pronoun was typically assigned to the (parallel) subject referent.

Gordon and Searce (1995) argue, however, that support for parallelism is subsumed by centering theory. The early evidence for parallelism is in line with the predictions made by centering theory. The problem with studies such as Grober et al is that parallelism is restricted to considering assignments to subject pronouns, by showing that subject antecedents are preferred to non-subject antecedents. From this evidence, it is unclear whether this preference is due to parallelism, or to a general strategy of assignment to the subject/first mentioned referent. The interpretation of non-subject pronouns in addition to subject pronouns must be considered in order to distinguish between parallelism and a subject bias.

Gordon and Searce go on to cite a more recent study by Crawley, Stevenson and Kleinman (1990) that examined the interpretation of non-subject pronouns when both subject and non-subject referents were available as antecedents. Crawley et al found a slight tendency for the subject to be preferred, suggesting some support

for a subject antecedent to be the default interpretation of a pronoun, rather than the antecedent in the parallel grammatical role.

However, a re-examination of Crawley et al's study by Smyth (1994) revealed a strong parallelism effect for non-subject pronouns in the subset of their materials which consisted of fully parallel sentences. Moreover, a study by Nelson, Stevenson and Stenning (1992) showed that the parallel interpretation of non-subject pronouns increased when the structural congruence of the adjacent sentences increased. This supports the notion that subject and non-subject pronouns are interpreted as referring to the subject referent when adjacent sentences are not structurally congruent, whereas a pronoun is interpreted as referring to the referent occupying the same grammatical role when adjacent sentences are parallel.

The parallelism effect highlights a limitation of centering theory. The grammatical function of a pronoun influences its interpretation, in addition to the grammatical function of the potential antecedents. Thus, the structural properties of adjacent utterances can have a role in determining coherence in addition to reference form. The parallelism effect contrasts with previous findings showing a repeated name penalty only for the subject/first mentioned antecedent (see the experiments by Hudson-D'Zmura et al, 1986, and Gordon et al, 1993 above), which is argued to indicate that coherence increases only when a pronoun refers to the Cb, independent of the pronoun's position.

Strong evidence against centering theory's claim that the Cb is the only site in an utterance where pronominalisation can maximise coherence comes from a recent study by Chambers and Smyth (1998). They found a repeated name penalty for

non-subject anaphors referring to non-subject referents in addition to subject anaphors referring to subject referents when both anaphors were in the same utterance, as long as the anaphor and antecedent were in parallel, structurally congruent sentences.

Their experiment investigating the repeated name penalty used three-sentence texts like (35). The third, target sentence in a text had the same, parallel structure as the preceding sentence. Targets contained both subject and non-subject anaphors with antecedents in the adjacent sentence occupying the same grammatical function. Targets had three possible versions, manipulating the reference type of the anaphors. In the Pro-Pro version (35c<sub>1</sub>) both subject and non-subject anaphors were pronouns. In the Pro-Name version (35c<sub>2</sub>) the subject anaphor was a pronoun and the non-subject anaphor was a repeated name. In the Name-Pro version (35c<sub>3</sub>) the subject anaphor was a repeated name and the non-subject anaphor was a pronoun. In the Name-Name version (35c<sub>4</sub>) both subject and non-subject anaphors were repeated names.

- (35) (a) A fight was in full swing in the back yard.
- (b) Debbie punched David in the nose.
- (c<sub>1</sub>) Then she slugged him in the ribs. [Pro-Pro]
- (c<sub>2</sub>) Then she slugged David in the ribs. [Pro-Name]
- (c<sub>3</sub>) Then Debbie slugged him in the ribs. [Name-Pro]
- (c<sub>4</sub>) Then Debbie slugged David in the ribs. [Name-Name]

Faster reading times were found for the Pro-Pro versions relative to the Pro-Name and Name-Pro versions. That is, there was a repeated name penalty for references

to both the subject antecedent and the non-subject antecedent in the utterance, simultaneously.

The results of these studies of parallelism indicate that centering theory does not account for certain instances of pronoun interpretation. The results demonstrate that the structural properties of adjacent utterances influence pronoun interpretation, and that the grammatical function of a pronoun has a role in determining coherence in addition to the potential antecedents. Recent results further suggest that an utterance may have more than one site where a pronoun can increase coherence. The parallelism effect using a repeated name penalty paradigm found by Chambers and Smyth, showing multiple pronouns increasing the coherence, contrasts with the Gordon et al's (1993) finding discussed above which showed a penalty for only the anaphor referring to the subject. This difference might be reconciled by consideration of the differences between the two sets of materials. Despite Gordon et al's materials containing subject and non-subject anaphors with antecedents occupying the same grammatical function in the adjacent sentence (like Chambers and Smyth's materials), the subject referent was most salient in the discourse, due to it being foregrounded by being introduced first and mentioned first in each of the preceding sentences. Gordon et al's failure to find a repeated name penalty for the non-subject referent is possibly due to the competing foregrounding bias from how the subject referent was realised in the preceding discourse. Support for this argument comes from a further experiment from Chambers and Smyth showing that competing salience from the prior foregrounding of a referent can attenuate the parallelism effect. In line with Gordon et al, they showed that the parallelism effect for non-subject pronouns was moderated by prior the salience of the subject referent conferred by

being introduced first. They found that non-subject pronouns were judged less likely to have parallel, non-subject antecedents when the subject antecedent was foregrounded.

Thus, it is clear that an account of parallelism is a necessary extension of centering theory. In the following sections, two notable extensions to centering theory are introduced that encompass a parallelism constraint in order to account for its effects. These are Suri and McCoy (1994) and Kameyama (1986). This is followed by a discussion of the influence of the passive construction in marking the subject referent as salient.. As mentioned above, the focusing of a referent may have an important role in influencing the effects of parallelism.

### ***Suri and McCoy's Current Focus and Subject Focus***

Suri and McCoy (1994) argue that one inadequacy of centering theory is that it is unable to account for certain instances of interpretation where more than one pronoun is mentioned in a sentence. Based on Sidner (1979, 1983), they propose two foci, the Current Focus and the Subject Focus, which tend to refer to distinct referents. Much like the Cb in centering theory, the Current Focus is based on Sidner's notion of the Discourse Focus, that is, what the sentence is 'about' (see Chapter 4 for further discussion of Sidner's framework). It is determined by a number of criteria, including preferences for old over new, pronominalised over full NP, non-subject position over subject position, and to continue rather than shift the Current Focus. Suri and McCoy, however, fail to specify exactly how these preferences might interact to determine the Current Focus. The Subject Focus is defined as being subject of a clause. Suri and McCoy claim that a non-subject pronoun is first tried against Current Focus for co-reference before trying

the Subject Focus, whereas a subject pronoun is first tried against the Subject Focus. That is, there is a preference for both subject and non-subject pronouns to have parallel antecedents.

The theory’s specifications typically result in the same interpretation preferences as centering theory. For instance, consider example (36), taken from Brennan et al (1987:157)<sup>10</sup>.

- (36) (a) Brennan<sub>1</sub> drives an Alfa Romeo.
- (b) She<sub>1</sub> drives too fast.
- (c) Friedman<sub>2</sub> races her<sub>1</sub> on weekends.
- (d) She<sub>2</sub> often beats her<sub>1</sub>.

In (9d), the pronoun *She* is correctly resolved with the Subject Focus (*Friedman*) and the pronoun *Her* is correctly resolved with the Current Focus (*Brennan*), in line with the interpretation predicted by centering theory. However, Suri and McCoy argue that centering theory incorrectly resolves pronouns such as *Her* in example (37b), taken from Suri and McCoy (1994:308).

- (37) (a) Lyn<sub>1</sub> races Susan<sub>2</sub> on weekends.
- (b) Jack races her<sub>2</sub> during the week.

According to centering theory’s proposals, the pronoun is resolved as referring to *Lyn* since the referent is Cp(U<sub>n-1</sub>). Such an interpretation is intuitively incorrect, and was dispreferred in an informal poll by Suri and McCoy. The preferred

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<sup>10</sup> The subscript numbering is included in order to distinguish the antecedent of an ambiguous pronoun. This is for illustrative purposes only. 1 stands for the first introduced potential antecedent in the discourse. This will be used to indicate all subsequent references to it. 2 stands for the

interpretation is correctly predicted as referring to the Current Focus (*Susan*). Suri and McCoy argue that sentences with multiple pronouns suggests that two foci are necessary in order to explain certain interpretation preferences. However, these preferences are also consistent with pronoun interpretation based on parallelism, that the grammatical role of a pronoun may be of importance.

***Kameyama’s Property-Sharing Constraint***

Kameyama (1985, 1986) developed a version of centering to explain the interpretation of zero-anaphora in Japanese, but it is applicable to pronoun interpretation in English too. She argues that the pronominalisation rule cannot sufficiently explain certain instances of pronoun interpretation. Kameyama (1986:203) uses examples (38) and (39) to illustrate the need for the pronominalisation rule to be replaced.

- (38) (a) Who is Max<sub>1</sub> waiting for?
- (b) He<sub>1</sub> is waiting for Fred<sub>2</sub>.
- (c) He<sub>2</sub> was invited by Max<sub>1</sub> to dinner.
- (39) (a) Who is waiting for Max<sub>1</sub>?
- (b) Fred<sub>2</sub> is waiting for him<sub>1</sub>.
- (c) He<sub>2</sub> was invited by Max<sub>1</sub> to dinner.

In both (38b) and (39b), *Max* is the Cb(U<sub>n</sub>). According to centering theory, (38c) is not acceptable because the utterance violates the pronominalisation rule, since *Max* remains the Cb and so should be realised with a pronoun because *Fred* is realised with a pronoun. In line with centering theory, informal acceptability

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second introduced potential antecedent.



judgements collected by Kameyama indicate that the text is not acceptable. Recall that the rule for pronominalisation states that the Cb( $U_n$ ) (*Max* in [38c]) should be realised as a pronoun if any element of Cf( $U_{n-1}$ ) is realised as a pronoun in  $U_n$  (*Fred* in [38c]). However, according to the recency rule, (39c) is not acceptable, since the non-Cb (*Fred*) is pronominalised but the Cb (*Max*) is not. Acceptability judgements collected by Kameyama indicate that the text is acceptable.

Kameyama's (1986) proposal was to replace the pronominalisation rule with a property-sharing constraint: "Two pronominal expressions [in English, unstressed pronouns] that retain the same Cb in adjacent utterances should share one of the following properties (in descending order of preference): 1) subject, 2) non-subject." (Kameyama, 1986:203). That is, the retention of the Cb across two adjacent utterances is preferred when two pronouns are either both subjects or both non-subjects, not preferred when only one is a subject. From this, it also follows that a switch in the Cb is only acceptable when the two pronouns have different grammatical roles. This constraint thus predicts that (11) is not acceptable but (12) is. In (11) the Cb switches from *Max*, the subject, to *Fred*, the subject. In (12) the Cb switches from *Max*, the non-subject, to *Fred*, the subject. Thus, the former is not acceptable because the two different Cbs are both subjects. The latter is more acceptable because the two different Cbs have different grammatical roles, non-subject and subject.

Kameyama further argues that entailment from the property-sharing constraint can extend it to account for the interpretation of multi-pronominal utterances, such as with the parallelism effect. She proposes that two ambiguous pronouns, such as in

(40b) (Kameyama, 1986:203), can be correctly interpreted because they conform to the property-sharing constraint.

- (40)
- (a)

Max<sub>1</sub> is waiting for Fred<sub>2</sub>.
- (b)

He<sub>1</sub> invited him<sub>2</sub> to dinner.

The property-sharing constraint, seeking parallelism between adjacent utterances, entails that there is a preference for the subject pronoun to refer to the subject of the previous utterance and for the non-subject pronoun to refer to the non-subject of the previous utterance.

Brennan et al (1987) argue against Kameyama’s property-sharing extension that seeks parallelism between adjacent utterances. Brennan et al (1987:157) claim instead that “parallelism is a consequence of our [centering theory’s] ordering of the Cf list by grammatical function and the preference for Continuing over Retaining”. In order to discuss this claim, a number of centering theory’s other postulates must be defined. These concern the inter-utterance transition states; Continue, Retain, and Shift. There is an additional rule which specifies that Continue is preferred over Retain which is preferred over Shift (Grosz et al, 1986). The transition states are defined as follows (following Brennan et al, 1987), recall that the Cb is the highest ranked element of the previous utterance that is realised in the current utterance, and the Cp is the most highly ranked referent in the current utterance:

	Cb(U <sub>n</sub> ) = Cb(U <sub>n-1</sub> )      Cb(U <sub>n</sub> ) ≠ Cb(U <sub>n-1</sub> ) or Cb(U <sub>n-1</sub> ) undefined	
Cb(U <sub>n</sub> ) = Cp(U <sub>n-1</sub> )	Continue	Smooth-Shift
Cb(U <sub>n</sub> ) ≠ Cp(U <sub>n-1</sub> )	Retain	Rough-Shift

Brennan et al argues that Kameyama's example (40) of the property-sharing between the subject pronoun in (40b) and the subject rather than the non-subject referent in the previous utterance (40a) is simply accounted for by centering theory's preference for Continue over Retain. In (40), the subject referent, *Max*, is the highest ranked in the utterance, i.e. the  $Cp(U)$ . There is a preference for the  $Cb(U_{n+1})$  to be the subject (Continue) rather than the non-subject (Retain). The preference for Continue over Retain thus gives the preferred pronominal interpretation without requiring any additional principle. Kameyama (1998), however, argues against Brennan et al's claim that parallelism can be accounted for by transition preferences. Kameyama (1998:95) supports her proposal with example (41).

- (41) (a) Babar<sub>1</sub> went to the bakery.  
 (b) The baker<sub>2</sub> greeted him<sub>1</sub>.  
 (c<sub>1</sub>) He<sub>2</sub> pointed at a blueberry pie. [SMOOTH-SHIFT]  
 (c<sub>2</sub>) He<sub>1</sub> pointed at a blueberry pie. [CONTINUE]

She argues that there is a preference for *He* to refer to *Baker* (41c<sub>1</sub>) rather than *Babar* (41c<sub>2</sub>) (acceptability judgements support this). Thus, a Smooth-Shift transition (the  $Cb[U_{n-1}]$  not being continued as the  $Cb[U_n]$ ) is preferred over a Continue transition (the  $Cb[U_{n-1}]$  and  $Cp[U_{n-1}]$  being continued as the  $Cb[U_{n-1}]$ ). Brennan et al's centering algorithm incorrectly predicts that *He* refers to *Babar*, that is, a Continue preferred over a Smooth-Shift transition. This rebuts Brennan et al's claim that parallelism is better explained in terms of the preference for Continuing. Instead, Kameyama claims that property-sharing's enforced parallelism is necessary for accounting for co-reference between *He* in (41c) ( $U_n$ )

and (41b) ( $U_{n-1}$ ). In these sentences, the  $Cb(U_{n-1})$  and  $Cp(U_{n-1})$  (in (41b), *Babar* and *Baker*, respectively) correspond to different referents. Thus, altogether, the interpretation preferences show that extending centering with the property-sharing constraint that enforces parallelism can provide interpretations of pronouns in multi-pronominal utterances and suggest how the parallelism preference can be incorporated into the centering framework.

To summarise, centering theory argues that the structural features of subjecthood and first mention determine the focusing of a referent. It is argued that referring to this focused referent in a subsequent utterance with a pronoun increases coherence, and this is the only site where a pronoun can increase coherence. Studies by Hudson and colleagues (Hudson-D'Zmura, Tanenhaus & Dell, 1986; Hudson-D'Zmura, 1988; Hudson-D'Zmura & Tanenhaus, 1998) and by Gordon et al (1993) support this claim, finding that reading times increased when the subject antecedent, but not the non-subject antecedent, was referred to with a pronoun anaphor. This contrasts with a recent study by Chambers and Smyth (1998). They found that non-subject pronouns referring to non-subject antecedents in addition to subject pronouns referring to subject antecedent could simultaneously increase coherence, as indicated by faster reading times, when both anaphors were in the same sentence, as long as the anaphor and antecedent were in parallel, structurally congruent sentences. The parallelism effect highlights a limitation of centering theory. The grammatical function of a pronoun influences its interpretation, in addition to the grammatical function of the potential antecedents. Thus, the structural properties of adjacent utterances can have a role in determining coherence in addition to reference form.

Suri and McCoy (1994) and Kameyama (1986) both propose extensions to centering theory that encompass a parallelism constraint in order to account for in certain instances of sentences with multiple pronouns. Suri and McCoy (1994) propose two foci, the Current Focus and the Subject Focus. The Current Focus is determined by a number of interacting criteria (see above) and is preferably not the subject of a clause. The Current Focus is the preferred referent of a non-subject pronoun. The Subject Focus is the subject of a clause and is the preferred referent of a subject pronoun. These preferences result in a preference for both subject and non-subject pronouns to have parallel antecedents. Kameyama's (1986) proposal was to replace the pronominalisation rule, which she argued cannot sufficiently explain certain instances of pronoun interpretation, with a property-sharing that enforces structural parallelism when retaining a Cb across two adjacent utterances. Kameyama further argues that this constraint also entails that there is a preference for the subject pronoun to refer to the subject of the previous utterance and for the non-subject pronoun to refer to the non-subject of the previous utterance.

In the following section, the role that the passive voice has on making this subject referent prominent will be discussed. The focusing effect of passives, compared to actives, has typically been overlooked in the recent psycholinguistic research. Earlier researchers argue that the passive subject is more salient than the corresponding active subject. It may be that a passive subject is focused relative to an active subject.

## *Passive Voice*

As well as investigating the effect of parallelism, the current study examined the impact of passive voice on how subsequent pronouns are interpreted. The passive subject is thought to be marked relative to the active subject, and thus may be preferred for subsequent reference with a pronoun.

The notion of markedness was developed to distinguish between typical, unmarked constructions and atypical, marked ones. The transformation of a proposition to a marked form retains the basic content, but changing the syntactic structure can emphasise certain information and alter the semantic content. Among marked forms, the passive construction is thought to have an important role in establishing the focus role. Ziff (1966) asserts that although corresponding active and passive sentences are thematically analogous they tend to differ in what they are 'about'. Davison (1984) argues that active and passive sentence subjects<sup>11</sup> differ in their markedness. Since the syntactic properties of marked constructions define the topic more strongly than canonical actives, the subject of a passive is 'more topical'<sup>12</sup> than the subject of an active. Including the Agent is optional in passives, and they are typically omitted (Svartvik, 1966). Since the Agent may be omitted altogether, this in itself suggests that the non-Agent, the surface subject, is important. In addition, even when the Agent is present, the choice of the passive, rather than its active counterpart, emphasises the importance of the non-Agent by

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<sup>11</sup> The terms subject and non-subject are used to refer to the surface subject and the surface object, respectively. In order to avoid confusion, the terms Agent and non-Agent are used where applicable to refer to the logical subject and logical object, respectively.

<sup>12</sup> Davison (1984:798) argues that "certain constituents of a sentence are perceived as more salient or marked than others, and these are [sentence] topics". This notion of sentence topic is analogous with the notion of the focus used here. For consistency, the term focus will be used.

putting it in the prominent subject/first mentioned position and demoting the Agent (e.g. Tannenbaum & Williams, 1968a).

Often cited experimental evidence for the claim that a passive subject is emphasised, but not an active subject, comes from Johnson-Laird (1968) and Tannenbaum and Williams (1968a, 1968b). Johnson-Laird (1968) obtained some support for the prominence of passive subjects. When asked to draw descriptions of active and passive sentences (e.g. *Blue proceeds red.* and *Blue is followed by red.*), participants used a larger area to represent the subject in a passive than an active. He argued that passives are communicatively appropriate when the non-Agent is important due to the emphasis they confer. Only limited generalisations can be made from this study, however. Materials were limited to variations of the two examples shown above, and restricted to the verbs *proceed* and *follow*.

Tannenbaum and Williams (1968a) suggest some evidence for the passive's role in emphasising the subject. Their participants were required to describe pictures depicting a transitive action between two entities after reading a preamble focusing one of them. Active descriptions were produced faster than their passive counterparts, but this difference greatly reduced with a preamble focusing the non-Agent. Tannenbaum and Williams argued that this is due to passives assigning prominence to the non-Agent. However, this result is also consistent with an effect of Given-New ordering, since the preambles only mentioned one of the picture's two entities. In a related study, Tannenbaum and Williams (1968b) extended previous results. They showed that the Agent was a better recall cue for the verb in a previously presented active sentence, whereas the non-Agent was a better

recall cue for the verb in a passive sentence. Comparable results were found with children, using picture cues instead of words (Turner & Rommetveit, 1968).

The studies above do suggest that a passive subject is emphasised. However, the evidence is not clear-cut. Indeed, the opposite view of prominence in passives has also been proposed. Fillmore (1968) argues that a passive can mark the Agent. Including the Agent, when it could be omitted, by the use of a full passive rather than a short passive suggests that it is of importance. Anisfeld and Klenbort (1973) assert that the explicit mention of the optional surface object in a passive draws the focus of attention to it, making it prominent. In a recent analysis of the use of passives by Hurewitz (1998) suggests that the passive subject is not prominent. She found that referents in subject position in the passive sentences in a corpus were less likely to be continued in the subject position in the following sentence compared to the referents in subject position in a random control sample of sentences from the corpus. Hurewitz argued that this is contrary to the notion that passives focus the subject referent. Also, the Agent of the passive rather than the subject referent was typically realised in the following utterance as the subject. This suggests that a passive with an overt Agent is used to shift attention on to the Agent, away from the non-Agent. However, care must be taken with these results, since the sentences with the passive voice examined were all of the *by*-phrase type.

In summary, a long-established linguistic intuition is that the passive voice has a role in focusing the subject referent. The subject referent in a passive is more salient than the subject referent in an active. This proposition receives some experimental support, although this data is by no means definitive, and the



opposite position is also suggested. As mentioned above, salience from being the first introduced referent in the discourse is shown by Chambers and Smyth to influence parallelism effects on pronoun interpretation. It may be that the use of the passive voice also influences the effect of parallelism.

The specific aim of the current study is to extend research on centering theory and parallelism to the analysis of inanimate referents, typically previously overlooked. Whether adjacent sentences containing two referents are parallel or non-parallel was varied, that is, whether the subject anaphor refers either to the subject or non-subject antecedent and whether the non-subject anaphor refers either to the non-subject or subject antecedent. The presence of a repeated noun phrase penalty with subject and non-subject anaphors is tested. According to centering theory, the subject referent will be the default interpretation of a following pronoun, irrespective of the pronoun's grammatical role. The theory's pronominalisation rule entails that coherence will be increased when a pronoun is used to refer to the subject referent whereas coherence is unaffected by the referential form of the anaphor used to refer to the non-subject referent. According to parallelism, the subject referent will be the preferred referent of a following subject pronoun while the non-subject referent will be the preferred referent of a following non-subject pronoun. Coherence will be increased both when a subject pronoun is used to refer to the subject referent and when a non-subject pronoun is used to refer to the non-subject referent.

A second aim of the experiments was to extend previous studies by investigating the impact of sentence voice on how subsequent pronouns are interpreted. Studies typically investigate sentences containing potential antecedents in the active voice.

We examine the robustness of the parallelism effect with sentences in the passive voice. According to the proposition that the passive subject is more marked as salient relative to the active subject, the parallelism effect might be moderated for non-subject antecedents. Including active sentences in addition to passives enables us to distinguish between the effect of the passive subject being salient and a general subject preference.

## **EXPERIMENTS 19A AND 19B**

Experiments 19a and 19b used a self paced reading time task to examine the effect of parallelism on pronoun interpretation with inanimate referents. Texts contained adjacent sentences with either parallel or non-parallel subject and non-subject anaphors as their antecedents. Centering theory would predict a repeated noun phrase penalty for the anaphor referring to the subject referent only, irrespective of the grammatical role of the pronoun. Parallelism would predict a repeated noun phrase penalty for both the subject anaphor referring to a parallel subject antecedent and the non-subject anaphor referring to a parallel non-subject antecedent, but not for either subject or non-subject anaphors with non-parallel antecedents. Texts in Experiment 19a had antecedents in sentences with the active voice whereas texts in Experiment 19b had antecedents in sentences with the passive voice. One might predict the parallelism effect would be moderated for non-subject antecedents in passive sentences due to the focusing of the subject antecedent. Alternatively, one might predict references to the passive subject will be pronominalised, irrespective of if the pronoun is in subject position or not.

## *Method*

### *Participants*

The participants were 64 undergraduate and postgraduate students from the University of Durham who volunteered or were paid a nominal sum for their participation.

### *Materials and Design*

The materials in each experiment consisted of 16 three-sentence texts mentioning two inanimate referents. The first sentence introduced the referents, one as the subject, the other as the non-subject. All of the NPs used had a frequency of at least 50/million (Thorndike & Lorge, 1944). The introductory sentence could be in either the active or passive voice. The second, target sentence again mentioned the two referents, one as the subject, the other as the non-subject. Targets had anaphors that had either parallel or non-parallel antecedents in the first sentence. The third sentence was a filler and was the same for all versions of the text. It continued the theme of the text but did not mention either referent.

Because of the large number of materials and the size of the experimental task that would be required if every participant were to see all different versions of the materials, the decision was made to run separate versions of the experiment. Experiment 19a used texts that had an introductory sentence with the active voice. Experiment 19b used texts that had an introductory sentence with the passive voice. Introductory sentences in both sentences were either Parallel or Non-Parallel with the following target sentence. In the Parallel condition, subject and non-subject anaphors referred to subject and non-subject antecedents,

respectively. In the Non-Parallel condition, subject and non-subject anaphors referred to non-subject and subject antecedents, respectively. Within each Parallelism condition, the target sentence had four possible versions defined by the combination of the two repeated factors Subject Anaphor (Pronoun vs. NP) and Non-Subject Anaphor (Pronoun vs. NP). The target sentences in the Pronoun-Pronoun condition had a mean length of 7.5 words. An example active text used in Experiment 19a, with the Pronoun-NP configuration of the target sentence, is shown in Table 15. Its passive counterpart used in Experiment 19b is shown in Table 16. The full set of materials is shown in Appendix A.

**Table 15: Example of materials used in the active version (Experiment 19a)**

<p><b>Antecedents in active context sentence</b></p> <p><b>Antecedents and anaphors occupy parallel grammatical roles</b></p> <p>The tent stood dangerously near to the river.</p> <p><b>Antecedents and anaphors occupy non-parallel grammatical roles</b></p> <p>The river threatened to waterlog the tent.</p>
<p><b>Target sentence [Pronoun-NP version]</b></p> <p>It had been pitched far too close to the river.</p>
<p><b>Filler sentence</b></p> <p>Heavy downpours had been forecast.</p>

**Table 16: Example of materials used in the passive version (Experiment 19b)**

<p><b>Antecedents in passive context sentence</b></p> <p><b>Antecedents and anaphors occupy parallel grammatical roles</b></p> <p>The tent could be swept away by the river.</p> <p><b>Antecedents and anaphors occupy non-parallel grammatical roles</b></p> <p>The river was channelled toward the tent.</p>
<p><b>Target sentence [Pronoun-NP version]</b></p> <p>It had been pitched far too close to the river.</p>
<p><b>Filler sentence</b></p> <p>Heavy downpours had been forecast.</p>

To ensure that the content of the target sentence contained pronouns biased to refer to the intended antecedent, an initial set of texts was constructed designed to bring about the intended interpretation. These were presented to four independent judges who were asked to say which of the two referents the initial pronoun referred to. Where there was disagreement, a new text was written, and the texts presented to a new set of judges. This procedure continued until all texts in each version were unanimously judged to contain a target sentence where the pronouns referred to their intended antecedents.

The experiments had a three factor design. Within each experiment (Active and Passive versions), the three repeated factors were Parallelism (Parallel vs. Non-Parallel), Subject Anaphor (Pronoun vs. NP), and Non-Subject Anaphor (Pronoun vs. NP). For illustrative purposes, the design of the factors is shown below.

<i>Parallelism:</i>	<b>Parallel</b>		or	<b>Non-Parallel</b>		
	<b>Pronoun</b>	<b>NP</b>		<b>Pronoun</b>	<b>NP</b>	
<i>Subject Anaphor:</i>	<b>Pronoun</b>	or	<b>NP</b>	<b>Pronoun</b>	or	<b>NP</b>
	<b>Pronoun</b>	or	<b>NP</b>	<b>Pronoun</b>	or	<b>NP</b>
<i>Non-Subject Anaphor:</i>	<b>Pronoun</b>	or	<b>NP</b>	<b>Pronoun</b>	or	<b>NP</b>
	<b>Pronoun</b>	or	<b>NP</b>	<b>Pronoun</b>	or	<b>NP</b>

A yes/no question was included at the end of each text to encourage participants to read for comprehension. Questions probed comprehension. A quarter of the questions concerned the first referent in the context sentence, a quarter concerned the second referent, and the remaining half concerned the filler sentence. Half of the correct answers to the questions were ‘yes’ and half were ‘no’.

Within both the Active condition and the Passive condition, eight lists were constructed by systematically varying the three factors counterbalanced across the two possible correct answers. Each text only appeared in one version in a list.

Twenty-four filler texts were intermixed with the experimental sentences. These were materials from a study not reported here. They were three-sentence texts but mentioned two individuals rather than two inanimates.

### *Procedure*

Participants carried out a self-paced reading time task with a sentence by sentence presentation. Each sentence appeared one at a time in the center of the computer screen. Prior to the experimental texts, participants were all presented with the same 16 practise trials, eight like the experimental texts and eight like the filler texts. All texts were presented to participants in a random order. Participants were assigned to either the Active or the Passive condition in the order they entered the laboratory. Alternate participants carried out one of the two conditions.

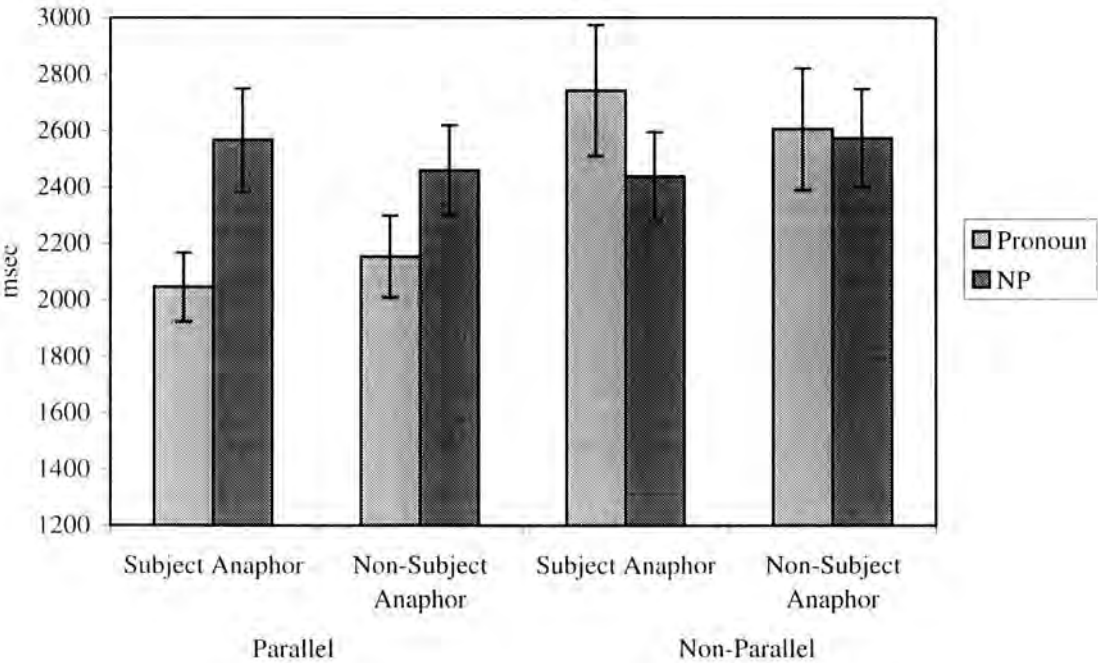
Before each text “Press space-bar for next trial” was presented in the centre of the screen. Pressing the ‘space-bar’ removed this message and the first sentence in the text appeared in its place. Participants were required to read and understand each sentence and then press the ‘space-bar’ as soon as they had done so. They were instructed to read as they would normally, and to try to understand the texts to the best of their ability. They were advised not to linger once the sentence had be read and understood. Pressing the ‘space-bar’ removed the sentence and replaced it with the next sentence in the text. Once the third sentence had been read and understood and the ‘space-bar’ pressed, the message “Question:-” appeared for

500 milliseconds, indicating that a question was to follow. This was then automatically replaced by the question. Participants were encouraged to ensure that they answered the questions correctly. After answering the question by pressing one of the two keys marked ‘yes’ or ‘no’, participants were prompted to start the next trial. The time taken to read the target sentence was recorded (in milliseconds), as was the responses to the questions.

**Results and Discussion**

The mean reading times for the target sentences in Experiment 19a (Active version) and Experiment 19b (Passive version) are shown below in Figure 20 and Figure 21, respectively. The reading time data for the target sentence was trimmed (based on clear discontinuities in the data). Reading times below 350 msec and above 5500 msec were removed.

**Figure 20: Mean reading times for the target sentences in the active condition (Experiment 19a)**

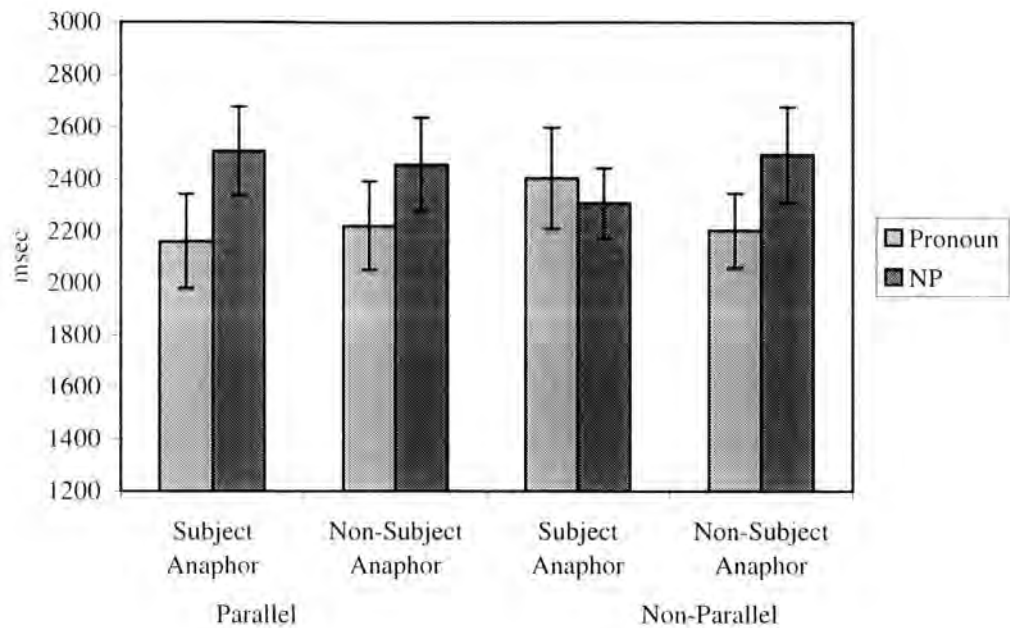


Considering Experiment 19a (the Active version), inspection of the means shows that parallel target sentences were read faster both when the subject anaphor was realised with a pronoun rather than a repeated noun phrase and when the non-subject anaphor was realised with a pronoun rather than a repeated noun phrase. Non-parallel target sentences were not read faster when the non-subject anaphor (i.e. the subject antecedent) was realised with a pronoun rather than a repeated noun phrase and when the subject anaphor (i.e. the non-subject antecedent) was realised with a pronoun rather than a repeated noun phrase.

Analyses of variance revealed that the effect of Subject Anaphor was not significant, whereas the interaction Parallelism X Subject Anaphor was significant [ $F_1(1,31) = 21.153, p < 0.001$ ;  $F_2(1,15) = 21.772, p < 0.001$ ]. This suggests that there was a repeated noun phrase penalty for subject anaphors in the parallel but not the non-parallel condition. The effect of Non-Subject Anaphor was marginally significant across both participants and items [ $F_1(1,31) = 3.196, p = 0.084$ ;  $F_2(1,15) = 3.781, p = 0.071$ ]. Comparison of the means suggests that this is due to the interaction. The interaction Parallelism X Non-Subject Anaphor was significant [ $F_1(1,31) = 5.578, p < 0.03$ ;  $F_2(1,15) = 7.476, p < 0.02$ ]. This suggests that there was a repeated noun phrase penalty for non-subject anaphors in the parallel but not the non-parallel condition. The effect of Parallelism was significant [ $F_1(1,31) = 8.551, p < 0.007$ ;  $F_2(1,15) = 11.993, p < 0.004$ ]. The interaction Subject Anaphor X Non-Subject Anaphor was marginally significant across both participants and items [ $F_1(1,31) = 3.184, p = 0.084$ ;  $F_2(1,15) = 4.239, p = 0.057$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 63 and 64.)



Figure 21: Mean reading times for the target sentences in the passive condition (Experiment 19a)



Considering Experiment 19b (the Passive version), inspection of the means shows that parallel target sentences were read faster both when the subject anaphor was realised with a pronoun rather than a repeated noun phrase and when the non-subject anaphor was realised with a pronoun rather than a repeated noun phrase. Non-parallel target sentences were read faster when the non-subject anaphor (i.e. the subject antecedent) was realised with a pronoun rather than a repeated noun phrase but not when the subject anaphor (i.e. the non-subject antecedent) was realised with a pronoun rather than a repeated noun phrase.

Analyses of variance revealed that the effect of Subject Anaphor was not significant, whereas the interaction Parallelism X Subject Anaphor was significant [ $F_1(1,31) = 4.956, p < 0.04$ ;  $F_2(1,15) = 22.761, p < 0.001$ ]. This suggests that there was a repeated noun phrase penalty for subject anaphors in the parallel but

not the non-parallel condition. There was a significant effect of Non-Subject Anaphor [ $F_1(1,31) = 13.772, p < 0.002$ ;  $F_2(1,15) = 12.329, p < 0.002$ ], whereas the interaction Parallelism X Non-Subject Anaphor was not significant. This suggests that there was a repeated noun phrase penalty for non-subject anaphors in both the parallel and the non-parallel condition. The interaction Subject Anaphor X Non-Subject Anaphor was significant across participants, but not across items [ $F_1(1,31) = 4.866, p < 0.04$ ;  $F_2(1,15) = 0.356, p = 0.555$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 65 and 66.)

In the active condition, there was a repeated noun phrase penalty for both subject and non-subject anaphors in the parallel but not the non-parallel condition. In the passive condition, there was a repeated noun phrase penalty for subject anaphors in the parallel but not the non-parallel condition, whereas there was a repeated noun phrase penalty for non-subject anaphors in both the parallel and the non-parallel condition. The results suggest, like Chambers and Smyth, that the effect of pronominalisation on increasing coherence is not limited to a single site. Parallel sentences have simultaneous coherence links back to the previous sentence at subject and non-subject positions. In both actives and passives, there was a repeated noun phrase penalty for both parallel subject anaphors and parallel non-subject anaphors. Comparison of the results from the active and passive versions shows that the parallelism effect for non-subject pronouns resists the competing influence of salience of the subject antecedent by the passive voice. Importantly, the comparison also suggests that the subject in a passive sentence, but not an active sentence, is emphasised as prominent. It shows that the passive subject is preferentially pronominalised, irrespective of whether or not the pronoun is in the parallel grammatical position.

## EXPERIMENTS 20A AND 20B

In the texts used in Experiments 19a and 19b, the sentence containing the anaphors was not systematically controlled for voice. In some texts it was active, in others it was passive. Experiments 20a and 20b attempt to replicate the previous results while attempting to control for this factor. Active sentences containing the antecedents were always followed by an adjacent active sentence containing the anaphors. Likewise, passive sentences were always followed by an adjacent passive sentence.

Experiments 20a and 20b used a self-paced reading time task along with a plausibility judgement task to examine the effects of parallelism and focusing on pronoun interpretation with inanimate referents. Texts contained adjacent sentences with either parallel or non-parallel subject and non-subject anaphors as their antecedents. Texts in Experiment 20a had texts with sentences in the active voice whereas texts in Experiment 20b had texts with sentences in the passive voice.

The experiments were an attempt to replicate the findings from Experiments 19a and 19b, which shows a repeated noun phrase penalty for both subject and non-subject anaphors in sentences parallel to the sentences containing their antecedents, suggesting a parallelism effect, together with a repeated noun phrase penalty for the passive subject referent, irrespective of whether the anaphor is in subject or non-subject position, suggesting a effect of the passive subject being focused. The experiments were also an attempt to test for these effects using a plausibility judgement methodology in addition to investigating a repeated noun

phrase penalty. Based on Experiments 19a and 19b, it was predicted that texts would be judged to be most plausible when a pronoun rather than a repeated noun phrase was used to refer the parallel subject and non-subject antecedents, and to refer to the passive subject antecedent.

## *Method*

### *Participants*

The participants were 64 undergraduate and postgraduate students from the University of Durham who volunteered.

### *Materials*

The materials consisted of 16 new two-sentence texts based on the texts used in Experiments 19a and 19b. The first sentence introduced two inanimate referents, one as the subject, the other as the non-subject, and could have either the active or passive voice. Again, separate versions of the experiment were run, an active version (Experiment 20a) and a passive version (Experiment 20b). The second, target sentence again mentioned the two referents. Unlike previous experiments, targets had the same voice as their introductory sentences. The mean length of the target sentences in the pronoun-pronoun condition was 7.3 words. Unlike previous experiments, texts consisted of two sentences, and did not contain a third, filler sentence. An example text in the active version, with the pronoun-NP configuration of the target sentence, is shown in Table 17. Its passive counterpart is shown in Table 18. The full set of materials is shown in Appendix A.

Table 17: Example of materials used in the active version (Experiment 20a)

<b>Antecedents in active context sentence</b>
<b>Antecedents and anaphors occupy parallel grammatical roles</b>
The river was rising towards the tent.
<b>Antecedents and anaphors occupy non-parallel grammatical roles</b>
The tent stood dangerously close to the river.
<b>Target sentence [Pronoun-NP version]</b>
It was inching extremely close to the river.

Table 18: Example of materials used in the passive version (Experiment 20b)

<b>Antecedents in passive context sentence</b>
<b>Antecedents and anaphors occupy parallel grammatical roles</b>
The tent might be swept away by the river.
<b>Antecedents and anaphors occupy non-parallel grammatical roles</b>
The river had been channelled towards the tent.
<b>Target sentence [Pronoun-NP version]</b>
It was pitched too close to the river.

*Design*

Experiments 20a and 20b had the same three factor design as Experiments 19a and 19b. Thus, within each experiment (Active or Passive), the three repeated factors were Parallelism (Parallel vs. Non-Parallel), Subject Anaphor (Pronoun vs. NP), and Non-Subject Anaphor (Pronoun vs. NP).

*Procedure*

Participants carried out a self-paced reading time task together with a plausibility judgement task. The procedure was similar to that used in Experiment 19a and 19b, except participants were required to judge whether or not the text was sensible rather than answer a comprehension question. Once the subject had read

and understood the second, target sentence and the 'space-bar' was pressed, the question "Does the text make sense?" was presented. Half of correct responses to the questions were 'yes', half were 'no'. Prior to the experiment, participants were presented with the same 12 practise trials; six like the experimental texts and six like the filler texts (see below).

Before the experiment began, careful instruction was given on answering the plausibility question. Explanations concerning what constituted a text not making sense focused on the semantic/pragmatic inconsistency of the verb prepositions in the two sentences. Explanations made no mention of the manner of realization of the antecedents/anaphors or of the sentence voice.

In addition to the 16 experimental texts, four sensible filler texts and 20 non-sensible filler texts were included. Thus, half of all the texts (experimental plus sensible fillers plus non-sensible fillers) were sensible and half were non-sensible. Fillers had a similar structure as the experimental texts, and were all two sentences long. Sensible fillers all contained two animate entities and an inanimate entity. Four of the non-sensible filler texts contained two animate entities and an inanimate entity, and eight contained an animate entity and an inanimate entity, and eight contained two inanimate entities. Non-sensible fillers were grammatical, but they were not semantically/pragmatically coherent; the verb prepositions in the two sentences were semantically/pragmatically inconsistent. An example non-sensible filler text is shown below.

The cabinet was far too small for the TV.

It was fitted into it with room to spare.

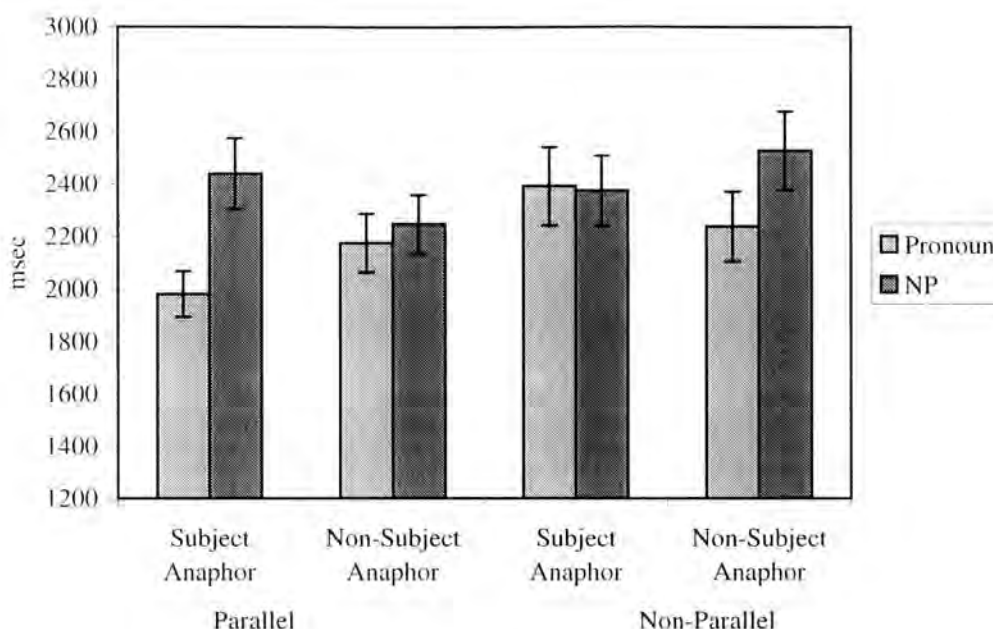
All fillers consisted of a mixture of both parallel and non-parallel sentences, with either an active or passive voice. Animate entities were introduced with either a name or a definite description. Anaphors were realised as either a pronoun or a NP.

To ensure that the experiment texts and the sensible filler texts were sensible, and that the non-sensible filler texts were non-sensible, texts were first rated for coherence. Texts were presented to four independent judges who were asked to say whether or not the proposition in the second sentence followed on naturally from the first. A new text was written where there was disagreement, and the texts presented to a new set of four judges. This procedure continued until all texts were unanimously judged to belong to their intended category of either sensible or non-sensible.

### ***Results and Discussion***

Two sets of anovas were conducted on the results from each experiment; one on the reading times for the targets in the texts judged to be plausible and one on the percentage of texts judged to be plausible. The reading time results are considered first, The reading times for the target sentences in Experiment 20a (Active version) and Experiment 20b (Passive version) are shown below in Figure 22 and Figure 23, respectively. The reading time data for the target sentence was trimmed (based on clear discontinuities in the data). Reading times below 350 msec and above 6000 msec were removed.

**Figure 22: Mean reading times for the target sentences in the active condition (Experiment 20a)**



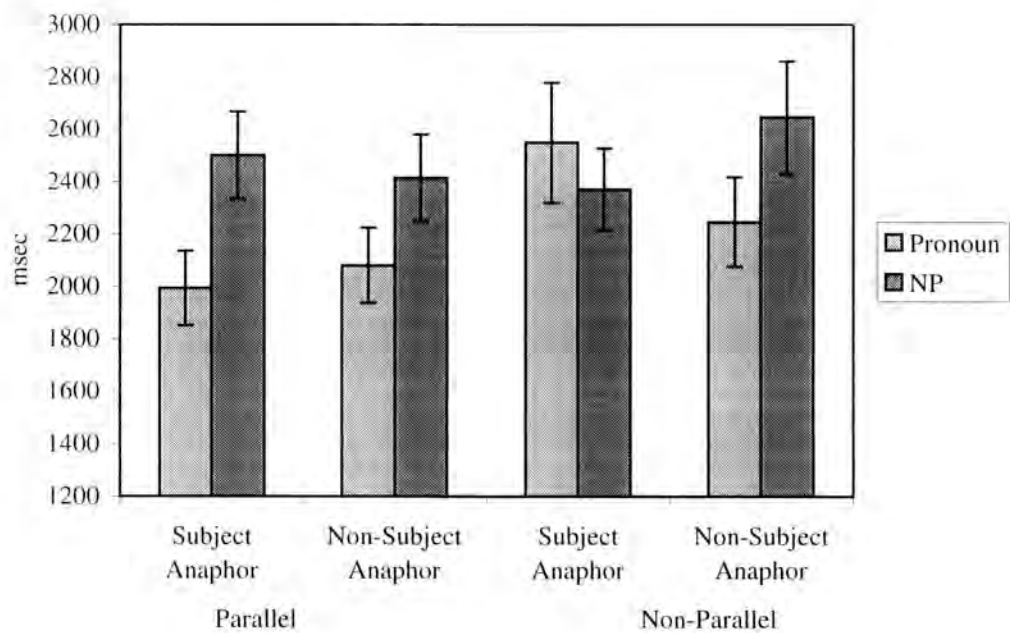
Considering Experiment 20a (the Active version) first, inspection of the means suggests that parallel target sentences were read faster when the either subject or non-subject anaphors were realised with a pronoun rather than a repeated noun phrase, although the effect seems smaller for the non-subject anaphors. Non-parallel target sentences were read faster when the non-subject anaphor (i.e. the subject antecedent) was realised with a pronoun rather than a repeated noun phrase, but not when the subject anaphor (i.e. the non-subject antecedent) was realised with a pronoun rather than a repeated noun phrase.

Analyses of variance revealed that the effect of Subject Anaphor was significant [ $F_1(1,31) = 10.466, p < 0.004$ ;  $F_2(1,15) = 21.977, p < 0.001$ ]. Comparison of the means suggests that this is due to the interaction. The interaction Parallelism X Subject Anaphor was significant across participants, although not so across items [ $F_1(1,31) = 4.870, p < 0.04$ ;  $F_2(1,15) = 1.846, p = 0.196$ ]. This suggests that



there was a repeated noun phrase penalty for subject anaphors in the parallel but not the non-parallel condition. The effect of Non-Subject Anaphor was significant across participants, although not so across items [ $F_1(1,31) = 13.050, p < 0.002$ ;  $F_2(1,15) = 2.057, p = 0.174$ ], whereas the interaction Parallelism X Non-Subject Anaphor was not significant. This suggests that there was a repeated noun phrase penalty for non-subject anaphors in both parallel and non-parallel conditions. The effect of Parallelism was marginally significant across participants, but not significant across items [ $F_1(1,31) = 3.678, p = 0.065$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 67 and 68.)

**Figure 23: Mean reading times for the target sentences in the passive condition (Experiment 20b)**



Considering Experiment 20b (the Passive version), inspection of the means suggests that parallel target sentences were read faster both when the subject anaphor was realised with a pronoun rather than a repeated noun phrase and when the non-subject anaphor was realised with a pronoun rather than a repeated noun

phrase. Non-parallel target sentences were read faster when the non-subject anaphor (i.e. the subject antecedent) was realised with a pronoun rather than a repeated noun phrase, but not when the subject anaphor (i.e. the non-subject antecedent) was realised with a pronoun rather than a repeated noun phrase.

Analyses of variance revealed that the effect of Subject Anaphor not significant across, but the interaction Parallelism X Subject Anaphor was significant [ $F(1,31) = 8.483, p < 0.008$ ;  $F_2(1,15) = 11.886, p < 0.005$ ]. This suggests that there was a repeated noun phrase penalty for subject anaphors in the parallel but not the non-parallel condition. The effect of Non-Subject Anaphor was significant [ $F(1,31) = 15.950, p < 0.001$ ;  $F_2(1,15) = 6.539, p = 0.03$ ], but the interaction Parallelism X Non-Subject Anaphor was not significant. This suggests that there was a repeated noun phrase penalty for non-subject anaphors in both the parallel and the non-parallel condition. The effect of Parallelism was significant [ $F(1,31) = 4.914, p < 0.04$ ;  $F_2(1,15) = 5.123, p < 0.02$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 69 and 70.)

Now considering the plausibility judgements, the percent of texts judged to be plausible in Experiment 20a (Active version) and Experiment 20b (Passive version) are shown below in Table 19 and Table 20, respectively.

**Table 19: Percentage of texts judged acceptable in the active version (Experiment 20a)**

	Parallel		Non-Parallel	
	Subject Anaphor	Non-Subject Anaphor	Subject Anaphor	Non-Subject Anaphor
Anaphor Type:				
Pronoun	94.53	95.32	83.60	85.16
NP	92.19	91.41	94.55	92.97

Considering Experiment 20a (Active version), the mean effect of Subject Anaphor was not significant, whereas the interaction Parallelism X Subject Anaphor was significant across items, although narrowly missing the standard level of significance across participants [ $F_1(1,29) = 3.548, p < 0.07$ ;  $F_2(1,15) = 8.758, p < 0.02$ ]. The mean effect of Non-Subject Anaphor was not significant, whereas the interaction Parallelism X Non-Subject Anaphor was significant across items, although narrowly missing the standard level of significance across participants [ $F_1(1,29) = 3.548, p = 0.07$ ;  $F_2(1,15) = 7.831, p < 0.02$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 71 and 72.)

Although the percentages for the parallel texts suggest that pronouns may be preferred over repeated noun phrases, the analysis revealed no clear effect of referent type for either subject or non-subject anaphors in the parallel condition on the judgements of plausibility for the active texts. However, the analysis shows that both non-parallel subject anaphors and non-parallel non-subject anaphors are more acceptable when they are repeated noun phrases rather than pronouns.

**Table 20: Percentage of texts judged acceptable in the passive version (Experiment 20b)**

	Parallel		Non-Parallel	
	Subject Anaphor	Non-Subject Anaphor	Subject Anaphor	Non-Subject Anaphor
Anaphor Type:				
Pronoun	92.19	96.10	82.82	90.63
NP	94.54	90.63	91.41	83.60

Considering Experiment 20b (Passive version), the mean effect of Subject Anaphor was not significant across participants, although marginally so across items [ $F_2(1,15) = 3.551, p = 0.079$ ]. The interaction Parallelism X Subject

Anaphor was not significant. The effect of Non-Subject Anaphor was significant [ $F_1(1,29) = 6.493, p < 0.02$ ;  $F_2(1,15) = 4.615, p < 0.05$ ], whereas the interaction Parallelism X Non-Subject Anaphor was not significant. The main effect of Parallelism was significant across participants, but not across items [ $F_1(1,29) = 8.529, p < 0.008$ ;  $F_2(1,15) = 1.875, p = 0.191$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 73 and 74.)

There was the hint of an effect of reference type for subject anaphors. There is the suggestion that repeated noun phrases are more acceptable than pronouns for subject anaphors in either parallel or non-parallel conditions, although there is no strong support. By contrast, there was an effect of referent type for non-subject anaphors in both parallel and non-parallel conditions, with pronouns being more acceptable than repeated noun phrases.

First considering the results of the plausibility judgement analyses (the reading time analyses are discussed below), in the active condition, there was no effect of referent type for either subject or non-subject anaphors in the parallel condition on judgements. By contrast, both subject and non-subject anaphors in the non-parallel condition were more acceptable when repeated noun phrases rather than pronouns. The finding that pronoun anaphors are less preferred than repeated noun phrase anaphors in non-parallel sentences provides further support for the effect of parallelism.

In the passive condition, there was no clear effect of referent type for subject anaphors in the parallel or the non-parallel condition. By contrast, non-subject anaphors in the parallel and the non-parallel condition were shown to be more acceptable when they are pronouns rather than repeated noun phrases. The finding

that pronoun anaphors are preferred when referring to non-parallel non-subject anaphors in the passive but not the active condition supports the proposal that the passive subject is focused.

It is perhaps surprising that there was a lack of clear effects of reference type on plausibility for anaphors with parallel antecedents. A similar experimental procedure was used by Hudson-D'Zmura and co-workers (Hudson-D'Zmura 1988; Hudson, Tanenhaus & Dell, 1986; Hudson-D'Zmura & Tanenhaus, 1998), who, investigating similar types of texts, found much wider differences in participants' judgements. There are two likely explanations for the findings in the current experiments. Firstly, very careful instruction was given on answering the plausibility question, focusing explicitly on the inconsistency of the verbs in the adjacent sentences. Based on this strict criterion, the texts in the parallel condition were clearly plausible, and so one might not expect any effect of reference type. The second explanation concerns the procedure for stimuli presentation used. On reading the second sentence, participants were required to press the 'space-bar', which brought up the warning "Question:-" for 500 milliseconds, which was only then followed by the question where participants could make their response. It is unclear what processing participants are carrying out during the delay between reading the text and the time when a response could be made. Indeed, following their participation in the experiment, a number of participants reported that they had sometimes attempted to make a judgement immediately upon reading the second sentence, rather than again pressing the 'space-bar', waiting for the question to appear on-screen, and then making their response.

Thus, it is unclear what processing was carried out during the period between a text being read to when the judgement was made. A more suitable procedure might be requiring participants to make judgements immediately upon reading the second sentence rather than requiring them to first press the 'space-bar', and so on. Since there are problems with the methodology used when collecting the judgements, it is suggested that the judgement data be treated with caution.

Considering the results of the reading times analyses, in the active condition, in line with Experiment 19a, there was a repeated noun phrase penalty for both subject and non-subject anaphors in the parallel but not the non-parallel condition. Unlike Experiment 19a, there was a repeated noun phrase penalty for non-subject anaphors in the non-parallel condition also. In the passive condition, in line with Experiment 19b, there was a repeated noun phrase penalty for subject anaphors in the parallel but not the non-parallel condition, whereas there was a repeated noun phrase penalty for non-subject anaphors in both the parallel and the non-parallel condition.

In line with Experiments 19a and 19b, the results suggest that the effect of pronominalisation on increasing coherence is not limited to a single site. The results show that parallel subject and non-subject antecedents are preferentially pronominalised, simultaneously. However, unlike the previous experiments, there was a repeated noun phrase penalty for non-parallel non-subject anaphors (i.e. subject antecedents) in both active and passive texts. In Experiments 19a and 19b, the finding of a repeated noun phrase penalty for the non-parallel non-subject anaphor in the passive but not the active condition was interpreted as the passive subject being more salient relative to the corresponding active subject.

The current finding in the active texts in addition to the passive texts indicates that the subject antecedent is preferentially pronominalised, irrespective of whether or not the pronoun is in the parallel grammatical position. As Smyth (1994) and Stevenson et al (1995) argue, a parallel function strategy, assigning pronouns to antecedents occupying the same grammatical function, and a general subject assignment, assigning pronouns to the subject antecedent regardless of the pronoun's role, both operate during pronoun comprehension. Smyth (1994) found that non-parallel non-subject pronouns were assigned to the subject antecedent. Experiments 21a and 21b attempt to address some of the issues raised in the discussion of these results by using the same procedure as that used in Experiments 19a and 19b.

## **EXPERIMENTS 21A AND 21B**

### ***Method***

#### *Participants*

The participants were 64 undergraduate and postgraduate students from the University of Durham who volunteered or were paid a nominal sum for their participation.

#### *Materials and Design*

The materials consisted of 16 two-sentence texts like the texts used in Experiments 20a and 20b, except a third, filler sentence was included, as in Experiments 19a and 19b. The full set of materials is shown in Appendix A. Again, separate versions of the experiment were run, an active version

(Experiment 21a) and a passive version (Experiment 21b). Experiments 21a and 21b had the same three-factor design as previous experiments. Thus, within each experiment (Active or Passive), the three repeated factors were Parallelism (Parallel vs. Non-Parallel), Subject Anaphor (Pronoun vs. NP), and Non-Subject Anaphor (Pronoun vs. NP).

The procedure for ensuring that pronouns were biased to refer to the intended antecedent was the same as that used in the previous experiments. Other details of the design were identical to that used in Experiments 19a and 19b, except for the following. Thirty-two filler texts were included, which were materials from a study not reported here. These were three-sentence texts mentioning two individuals. Yes/no questions following the text probed interpretation of the anaphor in the target (e.g. Was it the river that was inching closer?). Half concerned the first referent, half concerned the second referent.

### *Procedure*

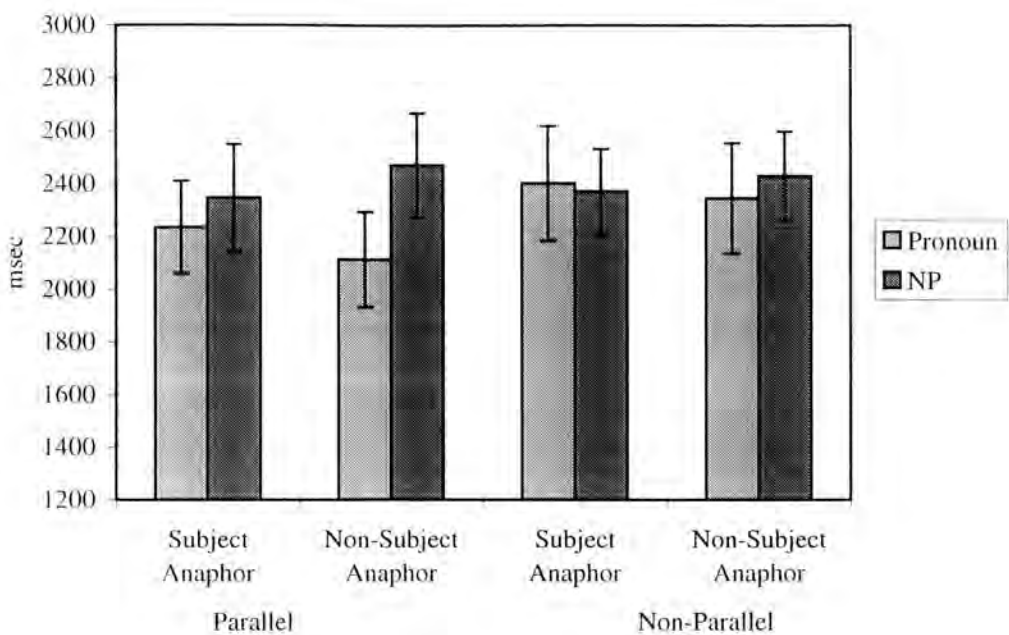
The procedure was identical to that used in Experiments 19a and 19b.

### ***Results and Discussion***

Like previous experiments, active and passive versions were analysed separately. The mean reading times for the target sentences in the active version and the passive version are shown in Figure 24 and Figure 25, respectively. The reading time data for the target sentence was trimmed (based on clear discontinuities in the data). Reading times below 350 msec and above 8000 msec were removed.



Figure 24: Mean reading times for the target sentences in the active condition (Experiment 21a)

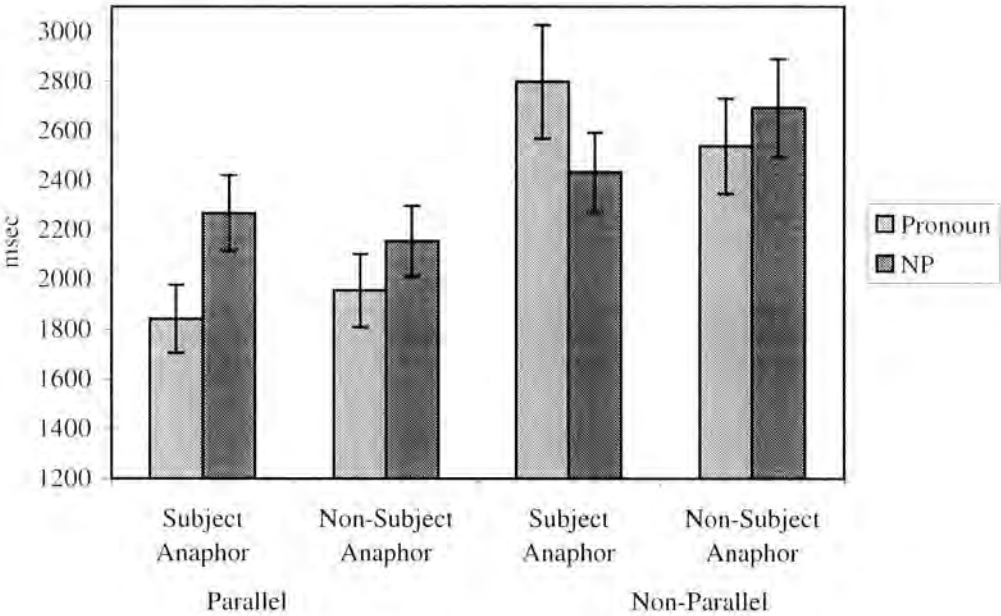


Considering Experiment 21a (the Active version) first, inspection of the means suggests that parallel target sentences were read faster when the non-subject anaphor was realised with a pronoun rather than a repeated noun phrase and possibly when the non-subject anaphor was realised with a pronoun rather than a repeated noun phrase. Non-parallel target sentences were possibly read faster when the non-subject anaphor (i.e. the subject antecedent) was realised with a pronoun rather than a repeated noun phrase, but not when the subject anaphor (i.e. the subject antecedent) was realised with a pronoun rather than a repeated noun phrase.

Analyses of variance revealed that the effect of Subject Anaphor and the interaction Parallelism X Subject Anaphor were not significant. Despite the suggestion of an effect of reference type for parallel subject anaphors, there was not a repeated noun phrase penalty for subject anaphors in either the parallel or the

non-parallel condition. The effect of Non-Subject Anaphor was significant across participants, but narrowly missing the standard significant level across items [ $F_1(1,31) = 8.454, p < 0.008$ ;  $F_2(1,15) = 4.509, p = 0.051$ ]. The interaction Parallelism X Non-Subject Anaphor was not significant. This suggests that there was a repeated noun phrase penalty for non-subject anaphors in both parallel and non-parallel condition. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 75 and 76.)

**Figure 25: Mean reading times for the target sentences in the passive condition (Experiment 21b)**



Considering Experiment 21b (the Passive version), inspection of the means shows that parallel target sentences were read faster both when the subject anaphor was realised with a pronoun rather than a repeated noun phrase and when the non-subject anaphor was realised with a pronoun rather than a repeated noun phrase. Non-parallel target sentences were read faster when the non-subject anaphor (i.e. the subject antecedent) was realised with a pronoun rather than a repeated noun

phrase but not when the subject anaphor (i.e. the non-subject antecedent) was realised with a pronoun rather than a repeated noun phrase.

Analyses of variance revealed that the effect of Subject Anaphor was not significant, whereas the interaction Parallelism X Subject Anaphor was significant [ $F(1,31) = 10.910$ ,  $p < 0.004$ ;  $F(1,15) = 4.680$ ,  $p < 0.05$ ]. This suggests that there was a repeated noun phrase penalty for subject anaphors in the parallel but not the non-parallel condition. There was no significant effect of Non-Subject Anaphor or Parallelism X Non-Subject Anaphor. Although in the means are in a direction suggesting that pronouns are faster than repeated noun phrases for non-subject anaphors in both parallel and non-parallel conditions, the analysis shows no significant effect. The main effect of Parallelism was significant [ $F(1,31) = 20.550$ ,  $p < 0.001$ ;  $F(1,15) = 12.984$ ,  $p < 0.004$ ]. All other effects were not significant. (For the ANOVAs see Appendix B, Tables 77 and 78.)

In the active condition, there was no repeated noun phrase penalty for subject anaphors in either the parallel or the non-parallel condition, whereas there was a repeated noun phrase penalty for non-subject anaphors in both parallel and non-parallel conditions, although this was relatively small in the non-parallel condition. In the passive condition, there was a repeated noun phrase penalty for subject anaphors in the parallel but not the non-parallel condition, whereas there was no repeated noun phrase penalty for non-subject anaphors in either the parallel or the non-parallel condition

## GENERAL DISCUSSION

In Experiments 19a and 19b, there was a repeated noun phrase penalty for both parallel subject anaphors and parallel non-subject anaphors, in both actives and passives, indicating a parallelism effect for actives and passives. Also, there was a repeated noun phrase penalty when referring to the non-parallel subject antecedent in passives but not actives, suggesting an additional focusing effect due to the passive construction.

Experiments 20a and 20b are less clear. First considering the acceptability judgements, in the active texts, although the means are in the direction that suggests that pronouns were preferred to noun phrase when referring to both subject and non-subject anaphors in the parallel texts, the analyses showed no significant differences. In the non-parallel texts, however, references to either subject or non-subject anaphors (i.e. non-subject and subject antecedents, respectively) were more acceptable when noun phrases rather than pronouns were used. This indicates the effect on texts being non-parallel. In the passive texts, there was no difference between pronouns and noun phrase for the subject anaphors in either the parallel or non-parallel conditions. By contrast, pronouns were more acceptable than noun phrases when referring to anaphors in the parallel condition and in the non-parallel condition (the latter being references to the subject antecedent). This latter finding suggests a focusing effect for passive, but not active, subjects.

Considering the reading times, like Experiments 19a and 19b, there was a repeated noun phrase penalty for both parallel subject anaphors and parallel non-subject

anaphors, in both actives and passives. This indicates a parallelism effect for active and passives. However, unlike the previous results, in addition to the repeated noun phrase penalty when referring to the non-parallel subject antecedent in passive texts, there was repeated noun phrase penalty when referring to the non-parallel subject antecedent in active texts also. This latter result does not support the notion that passives focus the subject.

Eye-balling the means in both Experiments 21a and 21b suggests a pattern similar to the reading times for Experiments 20a and 20b, respectively: repeated noun phrase penalties for both subject and non-subject anaphors in the parallel conditions, for both active and passive conditions; repeated noun phrase penalties for the non-subject anaphor, but not the subject anaphor, in the non-parallel condition. However, these preferences hinted at were not all significant in the analyses. It is unclear from the experiments reported here why these effects were not found. As such, the discussion will concentrate on Experiments 19a and 19b and Experiments 20a and 20b.

Thus, the main finding from this set of experiments is the role of parallelism in pronoun resolution, highlighting a limitation of centering theory. In general, the findings indicate that the grammatical function of a pronoun influences its interpretation, in addition to the grammatical function of the potential antecedents. This is shown for inanimate referents, previously overlooked. The findings of the repeated noun phrase penalties show that pronouns can increase the coherence of a discourse when they refer either to subject or non-subject antecedents, rather than just subject antecedents, as long as pronouns and antecedents occupy parallel grammatical roles. That the structural properties of adjacent utterances can have a

role in pronoun resolution contrasts with centering theory's claim that the ranking of referents in the Cf (by structural factors) alone determines how a subsequent pronoun is interpreted. Moreover, the simultaneous preference for pronominalising a non-Cb, provided the antecedent and anaphor as parallel, also suggests there can be more than one coherence link in an utterance. This contrasts with centering theory's claim that the Cb is the unique site where pronominalisation can increase coherence.

The current findings contrast with centering theory experiments testing the pronominalisation rule and the notion that there is a single Cb, which show a preference for pronouns to refer to the subject of the previous sentence, irrespective of whether the pronoun is in subject or non-subject position (e.g. Gordon et al, 1993; Hudson et al, 1986). However, Hudson et al (1986) only examined subject pronouns with potential subject and non-subject antecedents. That is, subject antecedents and anaphors were parallel, whereas non-subject antecedents had non-parallel (subject) anaphors. The preference for (subject) pronouns to have subject antecedents is in line with parallelism. Gordon et al (1993) considered non-subject pronouns in addition to subject pronouns, finding that the subject antecedent was the default interpretation of either subject or non-subject pronouns. However, the subject antecedent was also always foregrounded in the prior in the discourse, by being introduced first and mentioned first in each of the sentences preceding the critical sentence. The foregrounding bias of the subject antecedent may have influenced pronoun interpretation. Thus, doubt is cast on centering theory's account.

Suri and McCoy (1994) and Kameyama (1986), which both argue that centering theory cannot account for certain instances of pronoun interpretation, have proposed extensions in order to incorporate parallelism effects. Suri and McCoy proposes a dual focus account, with preferences for both subject and non-subject pronouns to have parallel antecedents, whereas Kameyama proposes a property-sharing constraint that seeks parallelism between adjacent utterances, with a preference for antecedents and anaphors in adjacent utterances to retain the same grammatical function. The current results suggest support for both proposals, although they do not distinguish between the two.

The general preference for a pronoun to refer to an antecedent occupying a parallel grammatical role, either subject antecedents or non-subject antecedents, suggests that centering theory's proposal of the ranking of potential antecedents is not a complete account of the use of pronouns. Centering theory would predict that it is felicitous to use a pronoun when referring to the subject but not a non-subject. The current study supports the previous findings (e.g. Chambers & Smyth, 1998; Stevenson et al, 1995) that it is felicitous to use a pronoun to refer to a non-subject, as long as the pronoun is also in non-subject position in a structurally parallel sentence. It indicates that the structural properties of a pronoun influence pronoun resolution. Moreover, the preferential pronominalisation of non-subject as well as subject anaphors suggests that centering theory's proposal, as it stands, that there is only a single site where a pronoun can increase the coherence between adjacent utterances requires changing. Additionally, as Chambers and Smyth argue, in order for centering theory to retain the claim that there is not more than one Cb in an utterance, the repeated name penalty cannot be a reliable diagnostic of the Cb. This suggests an

account of parallelism is a necessary extension of centering theory and of theories of focusing and pronoun interpretation is general.

As Smyth (1994) and Stevenson (1996) note, the effect of parallelism on pronoun assignment provides evidence for an account of pronoun interpretation that incorporates a strategy of feature matching. As mentioned in previous sections, Stevenson, Crawley, and Kleinman's (1994) results, for instance, suggest that a bottom-up first mention/subject assignment strategy is triggered by the subject and first mentioned pronoun (see also the results reported in Chapters 2 and 4). Greene, McKoon and Ratcliff (1992) suggest a framework for a mechanism of feature checking to retrieve the pronominal referent. According to Greene et al, referents in the discourse representation have a degree of activation relative to one another. They propose that the accessibility of referents is determined not only by the syntactic and semantic context in which they are introduced in the discourse, but also by the attributes of the cue used to re-access them. A pronoun acts as a cue to the likely antecedent (as can a definite description, etc). Greene et al supposes that pronoun assignment involves a process of matching the features of the pronoun and the features of the potential antecedents in the discourse model. The preferred antecedent of a pronoun is that which shares the most features with it. The current finding that pronouns are preferentially interpreted as referring to the antecedent occupying to same grammatical function supports such a claim.

In addition to the findings discussed above, the results also show preferences for pronouns over noun phrases when referring to antecedents in non-parallel sentences. Experiments 19a and 19b suggested evidence that the passive subject is more salient than the corresponding active subject. There was a preference for



pronominalising the passive subject, but not the active subject, irrespective of whether or not the pronoun and antecedent were in parallel grammatical positions, indicating that the passive voice makes the subject more prominent than the active voice. Despite this promising result, Experiments 20a and 20b cast doubt on this interpretation. In line with the claim that the passive subject of more salient than an active subject, texts were judged to be more plausible were a pronoun referred to a non-parallel subject antecedent in passives but not actives. As mentioned in the discussion of the judgement results, since there are problems with the methodology used when collecting the judgements, it is suggested that the judgement data be treated with caution. In contrast to the judgement results, the analysis of the reading times showed instead that to a non-parallel subject antecedent was preferentially pronominalised in both active and passive texts.

Experiments 21a and 21b were designed to address some of the issues raised by the two previous sets of experiments. However, their results remain inconclusive. Thus, one can only speculate as to the contrasting results. One explanation of the differences between Experiments 19a and 19b and the other experiments is that Experiments 20a and 20b and Experiments 21a and 21b used a different set of target sentences containing the anaphors in the latter two sets of experiments. Different targets must be used in order to control for the voice of the sentence. The results from the active and passive conditions are, thus, not directly comparable, unlike in Experiments 19a and 20a, which used the same target sentence for the active and passive conditions. This suggests that an alternative explanation of the results might be that the targets differed in plausibility. Although sentences were matched for length and pre-tests ensured that pronouns referred to their intended antecedent, sentences were not matched for plausibility.

Some sentences may be more plausible than others were, irrespective of any influence of parallelism.

Another suggestion for the finding that the subject antecedent is preferentially pronominalised, irrespective of whether or not the pronoun is in the parallel grammatical position is offered by Smyth (1994) and Stevenson et al (1995). As Smyth (1994) and Stevenson et al (1995) argue, a parallel function strategy, assigning pronouns to antecedents occupying the same grammatical function, and a general subject assignment, assigning pronouns to the subject antecedent regardless of the pronoun's role, might both operate during pronoun comprehension. Smyth (1994) found that non-parallel non-subject pronouns were assigned to the subject antecedent in texts where a strict definition of parallelism was not adopted. This suggests that the pronoun preference for subject antecedents in non-parallel active texts might be a result of these texts not conforming to a strong definition of non-parallelism (or parallelism). That is, it may be that the active texts in Experiment 20a contained adjacent sentences that were less parallel than those in the passive texts in Experiment 20b. The definition of parallelism used was less strict than that used previously (e.g. Chambers & Smyth, 1998; Smyth, 1994; Stevenson et al, 1995). In these earlier studies, a strict notion of parallelism was adopted, which is demonstrated to be a strong constraint. Moreover, the adjacent utterances were regularly semantically parallel in addition to them being structurally parallel (for example, from Chambers and Smyth, *Debbie punched David in the nose. Then she slugged him in the ribs.*). The same verb was even sometimes used in the two utterances. Smyth (1992) shows that the congruence of thematic roles enhances the parallelism effect. In the current study,

a looser definition of parallelism was adopted, due to difficulties in producing sufficient materials with only inanimate entities.

It may be that both a general subject assignment strategy and a focusing effect of the passive voice might operate. However, the current experiments fail to distinguish between the two effects. More importantly, the suggestion of a subject assignment strategy operating in the active texts also suggests that a subject assignment strategy could be operating in the passive texts, rather than effects being due to the passive subject being focused. Therefore, one cannot draw any conclusion regarding the differential effects of active and passive voice. Note that the preference for non-subject pronouns when referring to subject antecedents in the non-parallel texts cannot be accounted for by a simple approach to pronoun interpretation based on feature matching alone. A framework such as Greene et al can account for the preference, since this also incorporates the notion that referents in the discourse model have a degree of activation relative to one another, as determined by the context in which they are introduced in the discourse.

In summary, the parallelism effect provides a strong challenge to the current formulation of centering theory. According to centering theory, the preferred referent of a pronoun, either a subject or a non-subject pronoun, is the subject antecedent. However, in adjacent sentences that are structurally parallel, the preferred referent of a pronoun is the antecedent sharing the same grammatical function as the pronoun. In addition to centering theory's claim that the grammatical function of the potential antecedents determines the interpretation of a pronoun, the grammatical function of the pronoun can also have an influence.

Additionally, that subject and non-subject pronouns can simultaneously increase the coherence between adjacent sentences contrasts with a central claim of centering theory, that the Cb of the unique site for a pronoun to increase coherence. It is proposed that parallelism requires a model of pronoun resolution that incorporates a process of feature matching, whereby the pronoun acts as a cue to the likely antecedent; that which shares the most features with that pronoun.

This study also aimed to investigate the impact of sentence voice on the salience of the subject referent. There is a body of literature based on linguistic intuition for the differences between active and passive sentences, although experiments do not indicate strongly exactly how actives and passives differentially impact upon the processes of comprehension. Unfortunately, the current study fails to find strong evidence supporting the claim that the passive construction focuses attention into the subject more so than the corresponding subject of an active sentence. Various suggestions were put forward as suggested explanations of this finding, but the results as they stand cannot support any single interpretation.

## CHAPTER 6– CONCLUDING REMARKS

The aim of this thesis was to investigate theories of focusing. The proposals of various psychological and computational accounts of focusing and pronoun interpretation were contrasted in an attempt to obtain experimental evidence and to answer some of the questions that they raise. In each of the four experimental chapters, Chapters 2-5, various discourse factors proposed to affect the accessibility of discourse referents were compared and contrasted in order to determine their relative contributions and how they might combine when present together. This concluding chapter summarises the results from the experiments in each experimental chapter and their discussion, and considers some of the implications raised. Some suggestions for future research are included, as suggested by the findings.

In Chapter 2, three experiments examined the relative influences of thematic roles, naming, and surface position. Experiment 1 showed that the preference for the individual in the Stimulus role to be assigned to a subject pronoun was very strong when the Stimulus was mentioned first in the state sentence, but the Stimulus preference was reduced when it was mentioned second. There was competition between choosing the Stimulus and choosing the first mentioned referent. The naming effect was not found. This suggests that thematic role and surface position affect the accessibility of a pronominal referent.

A possible reason for the failure to replicate the naming effect is that all possible combinations of name and definite description of the two individuals were not examined. Experiment 2 included all four combinations of name and definite description. Experiment 2 replicated the results of Experiment 1, ruling out the

above possibility. This suggests that focusing preferences from thematic role and surface position take precedence over naming.

The failures to find a naming effect in Experiments 1 and 2 contrasts with previous findings where a thematic role manipulation was not included. To verify that name focusing occurs in the absence of thematic role focusing, Experiment 3 was conducted. Experiment 3 showed that a named individual was the preferred referent in the completions, irrespective of surface position, when the second individual was referred to with a definite description. This replicates the previous finding of name focusing. In line with previous results, there was no preference for one individual over the second when both were named, suggesting that the two names cancel each other out and the focus is split between the two. In contrast to previous results, the first mentioned individual was preferred when the two individuals were both described. A reanalysis of the items, nevertheless, showed that the surface position effect was restricted to the instances where the second individual was realised in a subordinate rather than main clause, suggesting an effect of subordination.

From this series of experiments, it was concluded that thematic role focusing, together with surface position focusing, override any focusing preferences due to the salience of names, replicating Stevenson, Crawley and Kleinman's (1994) original finding. Replicating Sanford, Moar and Garrod's (1988) finding, name focusing occurs in the absence of thematic role focusing. A further, tentative conclusion was also suggested. In the absence of thematic role focusing and name focusing, there was a main clause focus.

Experiment 3 examined continuation preferences in a sentence that did not immediately follow the critical sentence. It is argued that structural focus impacts upon what is mentioned next in the immediately adjacent sentence, not further. Thus, structural effects would not be predicted.

It was argued that the results may help to refine an activation based model of anaphor resolution by indicating the relative weights for thematic role cues, surface position cues and naming, and by indicating the circumstances under which a surface position effect is likely to be found. First, thematic role preferences are strongly weighted, overriding the contribution naming. This interacts together with structural position. Second, in the absence of these focus cues, naming determines salience. Additionally, it is suggested that main clauses are more strongly weighted than subordinate ones, in the absence of name focusing.

Obvious follow-up experiments are suggested by Experiment 3. Theories based on structural features argue that the first mentioned/subject antecedent is preferably continued in the following sentence. In Experiment 3, the filler sentence between the critical sentence and the continuation sentence suggests a reason for lack of a surface position effect; structural information can not affect what is mentioned on the sentence following. It would be instructive to examine name focus together with focusing from structural position. Another suggested experiment would be to investigate further the impact of clause subordination on naming that was suggested in the post-hoc analysis of the results in Experiment 3. It would also be instructive to examine the conclusions from this study in other kinds of sentences. Specifically, it would be useful to examine whether thematic role focusing is also



found for different verb types and connections, in addition to state verbs and a full stop.

In Chapter 3, five experiments examined the role of clause subordination on focusing in complex sentences. Experiment 4 showed that the main clause subject in complex sentences with a *that*-complement is the preferred referent of a subsequent pronoun, rather than the subordinate clause subject. The focus on the main clause subject suggests that such sentences are not treated as a sequence of separate utterances, with the focus being updated following each clause.

One problem with this interpretation, however, is that features other than the main clause focus may have signalled that the first mentioned referent is prominent. Experiment 4 ruled out this possibility, however. This supports the original conclusions that the main clause is focused and complement sentences are not treated as a sequence of utterances, processed one clause at a time.

These two experiments support the proposals from Kameyama (1998) that the main clause subject in *that*-complement sentences is focused, proposals that have previously not been tested experimentally. They also support the more general idea that the main clause is more focused than the subordinate clause, proposals that have previously received mixed support (e.g. Cooreman & Sanford, 1996).

The results suggest an extension to centering theory, which, as it stands, cannot account for how complex sentences are treated. Specifically, it suggests that the ranking main clause subject > complement clause subject must be incorporated into the centering framework for dealing with complex sentences containing a *that*-complement.

Experiments 6-8 investigated different types of complex sentences, those with a state verb main clause followed by a *because* clause. The results of Experiment 6 showed a null result; preferred referent of a subsequent pronoun was not affected by it being either the Stimulus or the Experiencer in the main clause of the complex sentence previous, nor by being either the subject or the non-subject in the subordinate clause.

A number of proposals were suggested as explanation of the failure to find any significant effects in Experiment 6. Experiments 7 and 8 attempted to investigate the matter further. Experiment 7 showed an Experiencer preference, which was larger when the Experiencer was the second mentioned in the main clause. This suggests the effects of both thematic role preferences for the Experiencer and a recency effect (but with recency being defined as the most recent referent in the main clause, not the subordinate clause). In addition to sentences with referents occupying Stimulus and Experiencer thematic role in the main clause, Experiment 7 also examined sentences proposed not to exhibit implicit causality. There was no preference for one individual over the other, suggesting that the focus is split between the two.

The finding of equal preferences for the first and second mentioned antecedents in no implicit causality sentences is in line with McKoon, Greene and Ratcliff's (1993, Experiment 7) findings. In the state verb sentences, there was the suggestion of a recency effect in conjunction with a thematic role effect. This has also been found by previous studies of thematic role focusing (e.g. Stevenson et al) and is also shown to have a strong influence by the experiments reported in Chapter 4. Focusing on the Experiencer is, however, is not typically found in

thematic role experiments with the connective *because*, which support instead a Stimulus preference. It is not clear from current research why the Experiencer is focused here. As yet, no suggestions can be offered as to the conditions under which the Experiencer becomes focused. The results are, nonetheless, in line with the intuitions of researchers of computational linguistics about the effect of (certain) perception statements on salience – the empathy effect, which in English typically manifests by making the Experiencer more prominent. All in all, the finding contrast with Suri and McCoy’s (1994) proposal that the main clause subject is preferred as the referent of a following subject pronoun, regardless of the other discourse factors present.

Experiment 8 had a design that systematically manipulated the factors, something not done in Experiment 6. It was conducted in an attempt to satisfy problems in Experiment 6. Experiment 8 showed that the subordinate clause subject is more focused than the main clause object, irrespective of whether the referent occupies either a Stimulus or an Experiencer thematic role in the main clause or is the main clause subject or object. This contrasts with Suri and McCoy’s (1994) proposal that the preferred antecedent of a subject pronoun in *SX because SY* complex sentences is the main clause subject. Instead, the result supports Kameyama (1998) extension to centering theory for these types of complex sentences, whereby the subordinate clause subject is focused following *because* complex sentences. The result suggests that *because* sentences are treated as a single utterance unit, processed one clause at a time, with the focus of the final clause in the complex sentence being the preferred antecedent.

Numerous follow-up experiments are suggested by this study. It would be instructive to examine further the findings here by investigating complex sentences of different types. Research has typically neglected complex sentences, concentrating instead on simple sentences. It would be useful to examine complex sentences that are adjuncts, conjuncts and relative clauses. Such an approach would provide important information on how various types of complex sentences are processed. It would also be instructive to investigate non-subject pronouns as well as subject pronouns. There may be important differences between the two. It would also be instructive to investigate further other thematic role and other connectives, in addition to state verbs and a full stop. Previous findings suggest clear differences with different kinds of thematic role focusing. Additionally, an analysis of non-subject referents, as well as subject referents, is also required.

In Chapter 4, a series of ten experiments examined the roles of animacy, thematic role and surface position in the focusing of referents. Experiments 9-10, which examined sentences containing a single animate referent and two inanimate referents, showed a preference for the animate referent, regardless of its thematic role or surface position in the sentence. Having established the dominance of animacy, the remaining experiments in this study examined the pattern of focusing when animacy cannot make a single referent focused, since thematic roles and surface position may have a stronger influence when animacy does not distinguish a single referent.

Experiments 12 and 13, which examined sentences containing two animate referents, one occupying the Theme role, showed that the Theme was preferred when it was one of the two animates, together with an additional effect of recency

if the most recent referent was animate. Stevenson et al's original data was also re-examined in order that the analyses used conformed to those used in the other studies here. Stevenson et al's experiment, which examined sentences containing two animate referents, with neither animate being the Theme, showed that the Goal and the most recent referent were preferred.

Experiments 14 and 15 examined sentences containing all animate referents and all inanimate referents, respectively. With all animates, the only clear-cut preference was for the most recent referent. A Theme preference was also statistically significant in the SG sentences, but this is difficult to interpret in the absence of a corresponding effect in the GS sentences. With all inanimates, the Theme was preferred. A Goal effect was also suggested, although this was only statistically significant in the SG sentences.

As a further check on the observed effects of thematic role and surface position in the absence of animacy and to examine the preferred choice of referent for a subsequent pronoun, Experiments 16-18 were conducted. Experiments 16-18, which examined sentences containing a single animate referent followed by the pronoun *It*, confirm the Theme preference. When the Theme was not available as the pronoun's antecedent, due to it being animate, there was a first mention effect, possibly due to a bottom-up strategy triggered by the pronoun.

From the results of Experiments 12-18, together with the results from Stevenson et al, it was concluded that there was a general focus on the Theme, which disappears in favour of a Goal preference only when both protagonists are animate and the Theme is inanimate. It was also concluded that the recency effect appears only when the most recent referent is animate. The recency effect is the overriding

effect in sentences with all animates, but the presence of both thematic role effects, Theme and Goal, emerge in all inanimates, as if the lack of recency permits these effects to be revealed.

The results together suggest weightings for the cues within an activation framework. The strongest preference was for a single animate referent. A single animate thus has a strong weighting which overrides the contributions of thematic role and surface position. The effects of thematic role and surface position are seen, but only when there is no single animate referent. When there is not exactly one animate referent the Theme has the next strongest weighting, together with the most recent referent if animate. These two weightings are approximately equal, since they appeared together when they were the two animates. Finally, the weighting for the Goal is the weakest, although it seems that an additional rule is required, stating that the Goal preference is seen when the Theme is inanimate.

The effect of animacy is in line with production literature on syntactic processing which suggests that animacy confers salience to the entity. This contrasts with both Sidner's (1979, 1983) and Stevenson et al's proposed thematic role preferences; respectively, that the Theme is focused and that the Goal is focused. This demonstrates that the focusing effect of animacy takes precedence over focusing from the thematic role preferences or structural features.

It would be instructive to examine the conclusions from this study in other kinds of sentences. Specifically, it would be useful to examine different verb types and connectives, and also to consider non-subject referents, in addition to subject referents. More generally, the dominance of the animacy effect suggests that

further consideration of its effects is necessary, effects that have typically been previously neglected in focusing research.

In Chapter 5, three two-part experiments examined the effect of parallelism, as contrasted with the claim that only a single pronoun in an utterance may increase the discourse coherence. It also contrasted the effects of active and passive voice. Experiments 19a and 19b showed a repeated noun phrase penalty for both parallel subject anaphors and parallel non-subject anaphors, in both actives and passives. This indicates a parallelism effect for both actives and passives. There was also a repeated noun phrase penalty for non-subject anaphors referring to the non-parallel subject antecedent in passives but not actives, suggesting an additional focusing effect due to the use of the passive.

Experiments 20 and 20b showed that active texts were judged to be more acceptable when a noun phrase was used for non-parallel anaphors, in line with the previous experiment using active texts. Indicating the effect of texts being non-parallel. By contrast, passive texts were judged to be more acceptable when a pronoun was used for non-subject anaphors referring to the non-parallel subject antecedent, again suggesting an additional focusing effect for passive subjects but not active subjects. Experiments 20 and 20b also showed the same repeated noun phrase penalties for the non-parallel texts as the previous two experiments. However, there was also a repeated noun phrase penalty for non-subject anaphors referring to the non-parallel subject antecedent in actives as well as passives. This latter result does not support the notion that passives increase the salience of the subject referent.

Experiments 21a and 21b were designed to investigate further this conflicting finding, using the same methodology as was originally used. The means in both Experiments 21a and 21b suggests a pattern similar to the reading times for Experiments 20a and 20b, respectively. However, these preferences hinted to failed to reach significance. It is unclear from the experiments reported in this study why these effects were not found. As such, doubt is cast on the reliability of the original finding suggesting the relative salience of a passive subject over an active subject. It may be that this finding is due to a general subject assignment strategy.

From this series of experiments, it was concluded that the grammatical function of a pronoun can influence its interpretation, in addition to the grammatical function of the potential antecedents, replicating previous studies of parallelism but using inanimate referents. The results suggest a model whereby that the accessibility of referents is determined not only by the syntactic and semantic context in which they are introduced in the discourse, but also by the attributes of the cue used to re-access them. The preferred antecedent of a pronoun is that which shares the most features with it.

Follow-up experiments suggested by the Experiments 19-21 include investigating the effects of voice in texts where sentences conform to a strict definition of parallelism. This would help distinguish the possible topicalisation effect of passives and a general subject assignment strategy. Additionally, but not necessarily using the parallelism effect, it would be instructive to investigate the differences between actives and passives further, since the current evidence is not



clear-cut. It would also be instructive to examine the effects of animacy on parallelism, judging by the dominance of animacy focusing observed in Chapter 4.

A number of general conclusions may be drawn from the results of the experiments reported in this thesis. The findings show the effects of a variety of kinds of focusing; focusing from how a referent is realised in the discourse, and focusing from the inherent features of a referent. These shifting patterns of focus are consistent with a framework based on activation, where elements in the discourse representation have a degree of activation relative to one another at any one time. Higher activation makes a referent more accessible in the mind of the comprehender. The activation of discourse referents can be influenced by numerous cues present in the discourse, syntactic, semantic, and pragmatic. The finding also suggests that the accessibility of referents is determined not only by the discourse context in which they are introduced, but also by the attributes of the cue used to re-access them. It is proposed that any framework of the mechanisms of the focusing of attention and the resolution of pronouns must incorporate such features in order to provide a full account.

The contrast of various accounts provides evidence enabling a step further towards developing an integrated model of the processes of comprehension. Although the studies reported in each of the four chapters were distinct, a number of tentative general proposals can be made regarding how the relative activation of potential antecedents may be estimated within the framework discussed. It is suggested that the feature of animacy has a strong weighting. Animacy is of crucial importance in the focusing phenomena and that focusing effects from how a referent is realised in the discourse depend upon animacy.

It seems that main clause focusing on the subject referent has the next strongest preference, overriding thematic role preferences. Note, however, it is not yet fully understood what preferences emerge when both the effects of thematic role focusing and clause subordination effect may be possible. It appears that the type of complex sentence within which a potential antecedent is realised affects preferences. The results are broadly in line with a linguistic hierarchy of clause type. As such, the salience of an animate, a subject, or a Stimulus etc may be moderated by the clause type. It is suggested that the recency effect is appears only when the most recent referent is animate, and is specifically concerned with the most recent referent in the main clause. Also, the recency effect is overridden by a first mention preference when a pronoun is present. It is shown that the pronoun itself may constrain the preferred pronominal referent. This suggests that a feature matching process is also used, with a preference for a pronoun to refer to the antecedent with which it shares the most features. Together, these suggest a dynamic model of focusing in which the effects of both features inherent in a referent and from how a referent is realised may establish and update the focus, and in which certain linguistic elements may trigger the current focus to be modified.

## APPENDIX A: EXPERIMENTAL MATERIALS

## *Materials used in Experiment 1*

The versions of the texts were as follows:

The third, state sentence has the Stimulus-Experiencer order.

The third, state sentence has the Experiencer-Stimulus order.

(Note: Both the order of the first two sentences in each text and the order of the referents in the third sentence in each text were counterbalanced. For considerations of space, only one order is shown here. For the same reason, the two possible modes of description for each referent [name or definite description] is shown in square brackets.)

1a.

[James / The businessman] rushed into the restaurant and sat down.

[The waiter / Alberto] wearily walked over to take the order.

Seafood platter was the only special available.

[James / The businessman] disapproved of [the waiter / Alberto]. He

1b.

[James / The businessman] rushed into the restaurant and sat down.

[The waiter / Alberto] wearily walked over to take the order.

Seafood platter was the only special available.

[James / The businessman] aggravated [the waiter / Alberto]. He

2a.

[Harry / The manager] was finishing compiling the performance figures.

[The trainee / Stephen] was now updating the computer files.

Everyone in the office had been especially busy today.

[Harry / The manager] admired [the trainee / Stephen]. He

2b.

[Harry / The manager] was finishing compiling the performance figures.

[The trainee / Stephen] was now updating the computer files.

Everyone in the office had been especially busy today.

[Harry / The manager] impressed [the trainee / Stephen]. He

3a.

[John / The batsman] only needed nine runs to win the game.

[The bowler / Paul] got the last man out after only three balls.

This was the final game of the season.

[John / The batsman] detested [the bowler / Paul]. He

3b.

[John / The batsman] only needed nine runs to win the game.

[The bowler / Paul] got the last man out after only three balls.

This was the final game of the season.

[John / The batsman] irritated [the bowler / Paul]. He

4a.

[Susan / The woman] ran out of the store without paying for the shopping.

[The policewoman / Julie] was walking the beat around the High Street.

At Christmas the town centre was always packed.

[Susan / The woman] hated [the policewoman / Julie]. She

4b.

[Susan / The woman] ran out of the store without paying for the shopping.

[The policewoman / Julie] was walking the beat around the High Street.

At Christmas the town centre was always packed.

[Susan / The woman] annoyed [the policewoman / Julie]. She

5a.

[Steve / The drummer] was trying to find his spare drumsticks.

[The guitarist / David] was preoccupied replacing his broken strings.

Band practise was always enjoyable.

[Steve / The drummer] respected [the guitarist / David]. He

5b.

[Steve / The drummer] was trying to find his spare drumsticks.

[The guitarist / David] was preoccupied replacing his broken strings.

Band practise was always enjoyable.

[Steve / The drummer] entertained [the guitarist / David]. He

6a.  
[Louise / The schoolgirl] was often late for many of her classes.  
[The headmistress / Brenda] was quite strict with the pupils.  
There would be a Maths test tomorrow morning.  
[Louise / The schoolgirl] disliked [the headmistress / Brenda]. She

6b.  
[Louise / The schoolgirl] was often late for many of her classes.  
[The headmistress / Brenda] was quite strict with the pupils.  
There would be a Maths test tomorrow morning.  
[Louise / The schoolgirl] troubled [the headmistress / Brenda]. She

7a.  
[Greg / The businessman] was drunk but wanted another drink.  
[The barman / Andy] had just called time at the bar.  
It was past midnight and the pub was almost empty.  
[Greg / The businessman] envied [the barman / Andy]. He

7b.  
[Greg / The businessman] was drunk but wanted another drink.  
[The barman / Andy] had just called time at the bar.  
It was past midnight and the pub was almost empty.  
[Greg / The businessman] bothered [the barman / Andy]. He

8a.  
[Sally / The secretary] was looking around for a new outfit.  
[The sales assistant / Betty] was putting prices on the dresses.  
Everything had been reduced by 50%.  
[Sally / The secretary] noticed [the sales assistant / Betty]. She

8b.  
[Sally / The secretary] was looking around for a new outfit.  
[The sales assistant / Betty] was putting prices on the dresses.  
Everything had been reduced by 50%.  
[Sally / The secretary] pleased [the sales assistant / Betty]. She

9a.  
[Nigel / The motorist] paid in cash for the work done on the car.  
[The mechanic / Trevor] had finished the MOT faster than expected.  
Only the oil filter had needed replacing.  
[Nigel / The motorist] appreciated [the mechanic / Trevor]. He

9b.  
[Nigel / The motorist] paid in cash for the work done on the car.  
[The mechanic / Trevor] had finished the MOT faster than expected.  
Only the oil filter had needed replacing.  
[Nigel / The motorist] impressed [the mechanic / Trevor]. He

10a.  
[James / The chef] had to cook for a hundred people at the restaurant tonight.  
[The grocer / Tony] only stocked the best quality vegetables in the shop.  
Runner beans were in season at the moment.  
[James / The chef] liked [the grocer / Tony]. He

10b.  
[James / The chef] had to cook for a hundred people at the restaurant tonight.  
[The grocer / Tony] only stocked the best quality vegetables in the shop.  
Runner beans were in season at the moment.  
[James / The chef] pleased [the grocer / Tony]. He

11a.  
[Diane / The businesswoman] was a demanding but fair boss to work for.  
[The secretary / Helen] was typing up the dictated letter.  
A large order had been placed so everyone was on overtime.  
[Diane / The businesswoman] valued [the secretary / Helen]. She

11b.  
[Diane / The businesswoman] was a demanding but fair boss to work for.  
[The secretary / Helen] was typing up the dictated letter.  
A large order had been placed so everyone was on overtime.  
[Diane / The businesswoman] pleased [the secretary / Helen]. She

12a.

[Angela / The nanny] enjoyed looking after other peoples children.  
[The mother / Janet] worked full-time and was always very busy.  
Caring for triplets could sometimes be hard work.  
[Angela / The nanny] trusted [the mother / Janet]. She

12b.

[Angela / The nanny] enjoyed looking after other peoples children.  
[The mother / Janet] worked full-time and was always very busy.  
Caring for triplets could sometimes be hard work.  
[Angela / The nanny] astounded [the mother / Janet]. She

13a.

[Martin / The motorist] slowed down when he saw the blue lights in the mirror.  
[The policeman / Darren] was on patrol along the motorway.  
Drivers tended to go especially fast along this stretch of road.  
[Martin / The motorist] resented [the policeman / Darren]. He

13b.

[Martin / The motorist] slowed down when he saw the blue lights in the mirror.  
[The policeman / Darren] was on patrol along the motorway.  
Drivers tended to go especially fast along this stretch of road.  
[Martin / The motorist] infuriated [the policeman / Darren]. He

14a.

[Luke / The director] shouted cut and told the crew to have a well-earned break.  
[The lead actor / Bruce] had been in every scene filmed today.  
Filming had begun at five that morning.  
[Luke / The director] respected [the lead actor / Bruce]. He

14b.

[Luke / The director] shouted cut and told the crew to have a well-earned break.  
[The lead actor / Bruce] had been in every scene filmed today.  
Filming had begun at five that morning.  
[Luke / The director] amazed [the lead actor / Bruce]. He

15a.

[Linda / The bride] wanted the wedding dress to be peach.  
[The seamstress / Ruth] specialised in making bridal-wear.  
August was the most popular time of year to get married.  
[Linda / The bride] admired [the seamstress / Ruth]. She

15b.

[Linda / The bride] wanted the wedding dress to be peach.  
[The seamstress / Ruth] specialised in making bridal-wear.  
August was the most popular time of year to get married.  
[Linda / The bride] delighted [the seamstress / Ruth]. She

16a.

[Brian / The driver] began to slow the train as it entered the station.  
[The inspector / Alfred] had to check the tickets from Kings Cross.  
Rush-hour was especially busy today.  
[Brian / The driver] envied [the inspector / Alfred]. He

16b.

[Brian / The driver] began to slow the train as it entered the station.  
[The inspector / Alfred] had to check the tickets from Kings Cross.  
Rush-hour was especially busy today.  
[Brian / The driver] charmed [the inspector / Alfred]. He

17a.

[Jake / The schoolboy] had just come top of the year five at school.  
[The headmaster / Colin] had run the school for almost ten years.  
Book-tokens were given out as prizes for hard-working pupils.  
[Jake / The schoolboy] admired [the headmaster / Colin]. He

17b.

[Jake / The schoolboy] had just come top of the year five at school.  
[The headmaster / Colin] had run the school for almost ten years.  
Book-tokens were given out as prizes for hard-working pupils.  
[Jake / The schoolboy] astounded [the headmaster / Colin]. He

18a.

[Chris / The driver] hummed to himself as he drove the bus.  
[The conductor / Geoff] walked around the bus collecting the fares.  
Rush-hour was especially busy today.  
[Chris / The driver] envied [the conductor / Geoff]. He

18b.

[Chris / The driver] hummed to himself as he drove the bus.  
[The conductor / Geoff] walked around the bus collecting the fares.  
Rush-hour was especially busy today.  
[Chris / The driver] amused [the conductor / Geoff]. He

19a.

[Gary / the apprentice] was weeding the boarders around the lawns.  
[The head-gardener / Cliff] was deciding where to plant the new shrubs.  
A late frost had killed off some of the plants.  
[Gary / the apprentice] scorned [the head-gardener / Cliff]. He

19b.

[Gary / the apprentice] was weeding the boarders around the lawns.  
[The head-gardener / Cliff] was deciding where to plant the new shrubs.  
A late frost had killed off some of the plants.  
[Gary / the apprentice] bored [the head-gardener / Cliff]. He

20a.

[Henry / The policeman] was filling out the arrest and interview reports.  
[The suspect / Barry] had now been locked in the police cell.  
Ten burglaries had been reported in the past week.  
[Henry / The policeman] distrusted [the suspect / Barry]. He

20b.

[Henry / The policeman] was filling out the arrest and interview reports.  
[The suspect / Barry] had now been locked in the police cell.  
Ten burglaries had been reported in the past week.  
[Henry / The policeman] angered [the suspect / Barry]. He

21a.

[Matt / The striker] took a shot but the ball went just wide.  
[The referee / Bill] blew the whistle for a goal kick.  
It was the last few minutes of the local cup final.  
[Matt / The striker] admired [the referee / Bill]. He

21b.

[Matt / The striker] took a shot but the ball went just wide.  
[The referee / Bill] blew the whistle for a goal kick.  
It was the last few minutes of the local cup final.  
[Matt / The striker] impressed [the referee / Bill]. He

22a.

[Frank / The fishmonger] was choosy about the quality of fish that he stocked.  
[The dockhand / Bert] unloaded the crates of fish from the boat.  
The fishing boats usually returned at four or five in the morning.  
[Frank / The fishmonger] liked [the dockhand / Bert]. He

22b.

[Frank / The fishmonger] was choosy about the quality of fish that he stocked.  
[The dockhand / Bert] unloaded the crates of fish from the boat.  
The fishing boats usually returned at four or five in the morning.  
[Frank / The fishmonger] pleased [the dockhand / Bert]. He

23a.

[Ken / The magician] had been hired to do a magic show at the party.  
[The little boy / Ben] was having a wonderful sixth birthday.  
All of the children were in fancy-dress.  
[Ken / The magician] appreciated [the little boy / Ben]. He

23b.

[Ken / The magician] had been hired to do a magic show at the party.  
[The little boy / Ben] was having a wonderful sixth birthday.  
All of the children were in fancy-dress.  
[Ken / The magician] amused [the little boy / Ben]. He

24a.

[James / The prosecutor] had thoroughly prepared the case for the prosecution.  
[The defendant / Tony] sat in the dock waiting for the trial to begin.  
A great deal of people had come to watch the proceedings.  
[James / The prosecutor] distrusted [the defendant / Tony]. He

24b.

[James / The prosecutor] had thoroughly prepared the case for the prosecution.  
[The defendant / Tony] sat in the dock waiting for the trial to begin.  
A great deal of people had come to watch the proceedings.  
[James / The prosecutor] angered [the defendant / Tony]. He

25a.

[Jenny / The businesswoman] had a demanding job and worked a lot of hours.  
[The maid / Nicola] enjoyed housework so this job was perfect.  
A lot more women had jobs than twenty years ago.  
[Jenny / The businesswoman] approved of [the maid / Nicola]. She

25b.

[Jenny / The businesswoman] had a demanding job and worked a lot of hours.  
[The maid / Nicola] enjoyed housework so this job was perfect.  
A lot more women had jobs than twenty years ago.  
[Jenny / The businesswoman] delighted [the maid / Nicola]. She

26a.

[Rob / The biker] walked outside and got onto his motorcycle.  
[The policeman / Ken] was stopping traffic to give random breath tests.  
Drink-driving always increased around the Christmas period.  
[Rob / The biker] noticed [the policeman / Ken]. He

26b.

[Rob / The biker] walked outside and got onto his motorcycle.  
[The policeman / Ken] was stopping traffic to give random breath tests.  
Drink-driving always increased around the Christmas period.  
[Rob / The biker] unsettled [the policeman / Ken]. He

27a.

[Phil / The groom] was feeling a little apprehensive about getting married.  
[The best-man / Alec] had been late because he had forgotten the rings.  
Most of the wedding guests had arrived.  
[Phil / The groom] saw [the best-man / Alec]. He

27b.

[Phil / The groom] was feeling a little apprehensive about getting married.  
[The best-man / Alec] had been late because he had forgotten the rings.  
Most of the wedding guests had arrived.  
[Phil / The groom] worried [the best-man / Alec]. He

28a.

[Mike / The soldier] could not get into the marines so he joined the RAF.  
[The general / Neil] bullied the new recruits in his battalion.  
The first few weeks of training were designed to be especially tough.  
[Mike / The soldier] detested [the general / Neil]. He

28b.

[Mike / The soldier] could not get into the marines so he joined the RAF.  
[The general / Neil] bullied the new recruits in his battalion.  
The first few weeks of training were designed to be especially tough.  
[Mike / The soldier] disgusted [the general / Neil]. He

29a.

[Andrew / The driver] was over half a lap ahead of the other cars.  
[The mechanic / Jimmy] in the pits was a formula 1 car expert.  
Oil was slowly leaking from the engine.  
[Andrew / The driver] trusted [the mechanic / Jimmy]. He

29b.

[Andrew / The driver] was over half a lap ahead of the other cars.  
[The mechanic / Jimmy] in the pits was a formula 1 car expert.  
Oil was slowly leaking from the engine.  
[Andrew / The driver] impressed [the mechanic / Jimmy]. He



30a.

[Claire / The waitress] dropped a plate when clearing away the dining room.  
[The landlady / Sharon] did not pay any of the hotel staff very well.  
All the rooms were fully booked for the next month.  
[Claire / The waitress] resented [the landlady / Sharon]. She

30b.

[Claire / The waitress] dropped a plate when clearing away the dining room.  
[The landlady / Sharon] did not pay any of the hotel staff very well.  
All the rooms were fully booked for the next month.  
[Claire / The waitress] infuriated [the landlady / Sharon]. She

31a.

[Simon / The vet] had to treat some animals on a distant farm  
[The farmer / Kevin] had been running the farm for several years.  
Some of the cattle did not look to be in the best of health.  
[Simon / The vet] doubted [the farmer]. He

31b.

[Simon / The vet] had to treat some animals on a distant farm  
[The farmer / Kevin] had been running the farm for several years.  
Some of the cattle did not look to be in the best of health.  
[Simon / The vet] unsettled [the farmer]. He

32a.

[Sir Peter / The judge] had a reputation for giving especially harsh sentences.  
[The lawyer / Marcus] knew his client was innocent but there was no alibi.  
The case was splashed all over the media.  
[Sir Peter / The judge] distrusted [the lawyer/ Marcus]. He

32b.

[Sir Peter / The judge] had a reputation for giving especially harsh sentences.  
[The lawyer / Marcus] knew his client was innocent but there was no alibi.  
The case was splashed all over the media.  
[Sir Peter / The judge] annoyed [the lawyer/ Marcus]. He

### ***Materials used in Experiment 3***

(Note: For considerations of space, the two possible modes of description for each referent [name or definite description] is shown in square brackets.)

1.

[Andrew / The newscaster] tried to carry on with the news report on the war and [Larry / the cameraman] continued to shoot the footage of the nearby fighting. Bullets flew overhead as the broadcast was made.

2.

[Andy / The soldier] ran another practise lap of the army assault course while [Graham / the corporal] waited in the barracks cleaning and checking the rifles. The battalion were being sent to Northern Ireland.

3.

[Gavin / The goalkeeper] had not let in any goals in the previous six games but [Mark / the striker] was still determined to score in the last minutes. A goal now would surely win the match.

4.

[Fiona / The businesswoman] carefully worked on the reports despite the turbulence while [Louise / the stewardess] stood in the isle demonstrating the crash-safety procedure. Thankfully, the plane was through the worst of the storm.

5.

[David / The suspect] sat locked in the cell while [Geoff / the constable] wrote the arrest report. Three burglaries had taken place in the last month.

6.

[Roger / The batsman] picked up the bat ready for the next innings and [Keith / the bowler] stood in the cricket nets practising a spin bowl. Play was about to resume after the rain.

7.

[Frank / The carpenter] shaved the doorframe down to the right size and [Colin / the builder] plastered the cracks in the wall. Hopefully, the repairs should be finished by the afternoon.

8.  
[Sharon / The schoolgirl] sat in the classroom listening as [Betty / the headmistress] read out the results of the test. Some of the marks were very impressive.
9.  
[Vicky / The nurse] ensured that the medical charts were up to date and [Angela / the matron] checked that there were enough syringes available. Hopefully, flu vaccinations would control the epidemic.
10.  
[Robert / The guitarist] liked the sound of the new Oasis songs whereas [Richard / the drummer] preferred playing jazz and funk. There were lots of new ideas for the gig tonight.
11.  
[James / The spy] slipped into the top-secret base through a hole in the fence while [Tony / the guard] walked around the building checking all the doors were locked. The new security systems were not working properly.
12.  
[Susan / The landlady] made a last minute check on the hotel roster and [Alice / the cleaner] went round quickly vacuuming the guestrooms. It was always busy at the start of the holiday season.
13.  
[George / The driver] sat driving the train and [Robin / the conductor] collected the fares. Thankfully, the long shift was almost over.
14.  
[William / The stockbroker] lost thousands speculating on the exchange but [Justin / the banker] had minimised losses by investing cautiously. It had been the biggest stock market crash ever.
15.  
[Simon / The policeman] stopped every single car for on the spot breathalyser checks but [Gary / the motorist] had not touched a drink the whole evening. There was a Christmas crackdown on drinking and driving.
16.  
[Marcus / The actor] went to the club to celebrate winning the award for best male role and [Jack / the chauffeur] waited with the limousine in the car park. Oscar parties usually lasted all night.
18.  
[Nathan / The waiter] started to serve the first course before it got cold and [Malcolm / the chef] made the finishing touches to the desserts. The restaurant was very busy.
19.  
[Douglas / The accountant] advised the company to reduce spending whereas [Gregory / the manager] believed that spending was needed to expand the business. One option was to secure another loan.
20.  
[Tom / The pilot] sat in the cockpit waiting to take-off while [Jim / the mechanic] did the final safety checks on the bomber's undercarriage. Ten planes were to be scrambled to carry out the raid.
21.  
[Anthony / The lifeguard] patrolled the coast warning of the sea currents but [Jake / the surfer] paddled out with the surfboard in order to catch the waves. Red danger flags were up all over the beach.
22.  
[Ken / The butcher] was offering 50% off pork chops and [Fred / the fishmonger] was selling salmon steaks at bargain prices. Times had been hard since the big superstore opened last March.
23.  
[Julia / The receptionist] was always on duty in case there was a phone call whereas [Karen / the secretary] could always be found gossiping in the office canteen. There wasn't all that much work to do at the moment.
24.  
[Rose / The usherette] pointed with the torch to where the popcorn had been spilt while [Denise / the cleaner] walked down to the part that needed sweeping. The new 'Star Wars' film pulled in a packed house every night.
25.  
[William / The pilot] quickly tried to radio the control tower for help as [Jimmy / the hijacker] burst into the cockpit threatening to use the gun. A bomb had been smuggled on-board the plane.
26.  
[Justin / The mechanic] had said that the car wasn't 100% race ready but [Stanley / the driver] still succeeded in winning the Spanish Grand Prix by a half a lap. Fitting the newly designed engine would make even more of a difference.
27.  
[Rob / The dock worker] sat idly on the quayside waiting to help unload while [Derek / the fisherman] steered the trawler into the harbour. Catches were very small because of over-fishing.

28.  
[Ray / The referee] decided to stop the contest in the seventh round when [Greg / the boxer] received a bad blow to the left eye. The rules said that such a nasty cut was too dangerous to carry on with.
29.  
[Becky / The barmaid] had collected a fair amount of tips behind the bar whereas [Lisa / the waitress] had not been tipped once for serving the meals. It was hotel policy to pool the tips at the end of the night.
30.  
[Vincent / The porter] was struggling to carry the suitcases up to just the second floor but [Steve / the businessman] always stayed in the penthouse when away at a conference. Repairs to the lifts should only take a moment.
31.  
[Annabel / The bride] had wanted to have a simple white wedding but [Lucy / the seamstress] said that it would be just as cheap to make a dress in the ivory lace. It was four months until the big day so there was plenty of time for the fittings.
32.  
[Alan / The cadet] was fresh from the naval academy last week whereas [Patrick / the admiral] had commanded a battleship for over four years. Going into battle, however, was always a frightening experience.

### ***Materials used in Experiment 4***

The versions of the texts were as follows:

The third, target sentence contains a pronoun referring to the main clause subject.

The third, target sentence contains a pronoun referring to the subordinate clause subject.

1a.

Thomas attacked Ronald in a dark alley the other night.

Ronald believed that he was going to shoot him.

Then he screamed for help.

1b.

Thomas attacked Ronald in a dark alley the other night.

Ronald believed that he was going to shoot him.

Then he pulled the trigger.

2a.

Darren visited Martin at the social security office the other day.

Martin confirmed that Darren was not entitled to any sickness benefit.

Then he interviewed the next claimant.

2b.

Darren visited Martin at the social security office the other day.

Martin confirmed that Darren was not entitled to any sickness benefit.

Then he made an immediate appeal.

3a.

Keith had been fined by James in the court before.

James now ordered that he be sentenced to three years imprisonment.

Then he heard the next case.

3b.

Keith had been fined by James in the court before.

James now ordered that he be sentenced to three years imprisonment.

Then he was taken into custody.

4a.

John told Bill to open the safe or he would shoot.

Bill did everything that John told him to do.

Then he handed over all the money.

4b.

John told Bill to open the safe or he would shoot.

Bill did everything that John told him to do.

Then he ran off with the money.

5a.

Susan was being interviewed by Linda for a very important job.

Linda required that Susan be able to do the work successfully.

Then she made an offer of employment.

5b.

Susan was being interviewed by Linda for a very important job.  
Linda required that Susan be able to do the work successfully.  
Then she produced a list of references.

6a.

Angela sold Fiona a vacuum cleaner that wasn't working properly.  
Fiona claimed that she had taken money under false pretences.  
Then she demanded a full refund.

6b.

Angela sold Fiona a vacuum cleaner that wasn't working properly.  
Fiona claimed that she had taken money under false pretences.  
Then she gave the money back.

7a.

Simon had kicked Trevor quite hard when they were playing football.  
Trevor suspected that he might have done it on purpose.  
Then he limped off the pitch.

7b.

Simon had kicked Trevor quite hard when they were playing football.  
Trevor suspected that he might have done it on purpose.  
Then he did it again later.

8a.

Jenny sold Emma a faulty computer at her new shop in town.  
Emma demanded that she refund her money.  
Then she was given a replacement machine.

8b.

Jenny sold Emma a faulty computer at her new shop in town.  
Emma demanded that she refund her money.  
Then she offered to exchange the goods.

9a.

Paul knocked at Steve's front door this morning.  
Steve checked that he was in fact from the gas board.  
Then he opened the door.

9b.

Paul knocked at Steve's front door this morning.  
Steve checked that he was in fact from the gas board.  
Then he fixed the leak.

10a.

Sarah worked with Karen for a large firm of accountants in London.  
Karen found that she had been stealing stationery from the office.  
Then she informed the manager.

10b.

Sarah worked with Karen for a large firm of accountants in London.  
Karen found that she had been stealing stationery from the office.  
Then she returned the items.

11a.

Ruth always pestered Jane when she was trying to revise.  
Jane asked that she leave the room immediately.  
Then she continued to study.

11b.

Ruth always pestered Jane when she was trying to revise.  
Jane asked that she leave the room immediately.  
Then she pestered even more.

12a.

Helen asked Wendy for advice on what she should do after leaving school.  
Wendy suggested that she might like to work for her.  
Then she made a formal job offer.

12b.

Helen asked Wendy for advice on what she should do after leaving school.  
Wendy suggested that she might like to work for her.  
Then she decided to go to college.

13a.

Joanne had an accident while Kathy was looking after her.  
Kathy prayed that she would make a full recovery.  
Then she walked from the church.

13b.

Joanne had an accident while Kathy was looking after her.  
Kathy prayed that she would make a full recovery.  
Then she died from the injuries.

14a.

Julie was always naughty during Rachel's lessons.  
Rachel decided that she was disrupting the class.  
Then she informed the headmaster.

14b.

Julie was always naughty during Rachel's lessons.  
Rachel decided that she was disrupting the class.  
Then she was expelled from school.

15a.

Chris started an argument with Mark.  
Mark insisted that he should leave or be thrown out.  
Then he called for the security office.

15b.

Chris started an argument with Mark.  
Mark insisted that he should leave or be thrown out.  
Then he was escorted off the premises.

16a.

Sarah told Penny that she had been made homeless.  
Penny had said that she could sleep in the spare room tonight.  
Then she withdrew the offer to stay.

16b.

Sarah told Penny that she had been made homeless.  
Penny had said that she could sleep in the spare room tonight.  
Then she asked to stay another night.

17a.

Tina complained to Anne that she had been unfairly dismissed from work.  
Anne thought that she should be given another chance.  
Then she decided not to get involved.

17b.

Tina complained to Anne that she had been unfairly dismissed from work.  
Anne thought that she should be given another chance.  
Then she was reinstated later that day.

18a.

Tony accused Peter of starting the house fire the other night.  
Peter argued that he didn't have any hard evidence against him.  
Then he denied any involvement.

18b.

Tony accused Peter of starting the house fire the other night.  
Peter argued that he didn't have any hard evidence against him.  
Then he made a citizen's arrest.

19a.

Ray decided to stay with Bob for a few nights.  
Bob hoped that he would leave very soon.  
Then he asked for some rent money.

19b.

Ray decided to stay with Bob for a few nights.  
Bob hoped that he would leave very soon.  
Then he asked to stay for longer.

20a.

Robert thought that Peter was a poor political leader.  
Peter discovered that Robert had contested the leadership of the party.  
Then he stepped down as party leader.

20b.

Robert thought that Peter was a poor political leader.  
Peter discovered that Robert had contested the leadership of the party.  
Then he tried to contest it again.

### *Materials used in Experiment 5*

The versions of the texts were as follows:

The third, target sentence contains a pronoun referring to the main clause subject.

The third, target sentence contains a pronoun referring to the subordinate clause subject.

1a.

Jill was listening to the stereo while Kate revised.  
Kate wished that she would turn the music down.  
She had an exam on Monday.

1b.

Jill was listening to the stereo while Kate revised.  
Kate wished that she would turn the music down.  
She had it at full volume.

2a.

Paul threatened Bill with a knife yesterday evening.  
Bill had been really afraid that he would use it.  
He handed over cash and jewellery.

2b.

Paul threatened Bill with a knife yesterday evening.  
Bill had been really afraid that he would use it.  
He escaped with cash and jewellery.

3a.

Ruth asked to borrow Jane's car for a few days.  
Jane said that she could have it for the whole week.  
She did not need it until Saturday.

3b.

Ruth asked to borrow Jane's car for a few days.  
Jane said that she could have it for the whole week.  
She needed it for getting to work.

4a.

Jack tripped and fell right in front of Mark.  
Mark rushed over to check that he was okay.  
He was a fully trained medic.

4b.

Jack tripped and fell right in front of Mark.  
Mark rushed over to check that he was okay.  
He appeared to be badly hurt.

5a.

Gail offered to do the accounting for Lynn.  
Lynn was extremely glad that she had volunteered to help.  
She didn't have a head for figures.

5b.

Gail offered to do the accounting for Lynn.  
Lynn was extremely glad that she volunteered to help.  
She had a great head for figures.

6a.

Joan had arrested Mary soon after the money had gone missing.  
Mary argued that she had absolutely no evidence to justify this.  
She continued to deny any involvement.

6b.

Joan had arrested Mary soon after the money had gone missing.  
Mary argued that she had absolutely no evidence to justify this.  
She could not prove any involvement.

7a.

Dean had been questioned by Phil for a long time.  
Phil could now prove that he was responsible for the burglary.  
He had enough evidence for a conviction.

7b.

Dean had been questioned by Phil for a long time.  
Phil could now prove that he was responsible for the burglary.  
He had been seen breaking and entering.

8a.

Fred applied to Jake for an extremely demanding job.  
Jake thought that he would be perfect for the position.  
He decided to offer the job straight away.

8b.

Fred applied to Jake for an extremely demanding job.  
Jake thought that he would be perfect for the position.  
He was given the job without an interview.

9a.

Julie begged Claire for a loan to pay the rent.  
Claire said that she could borrow £200 until next month.  
She had just been paid yesterday.

9b.

Julie begged Claire for a loan to pay the rent.  
Claire said that she could borrow £200 until next month.  
She really did need the money.

10a.

Dave had been saving to buy John's old motorcycle.  
John said that he could have it for £500.  
He could no longer afford to run it.

10b.

Dave had been saving to buy John's old motorcycle.  
John said that he could have it for £500.  
He could afford to buy it right away.

11a.

Nigel was taken in by everything that Matt had said.  
Matt had managed to trick him out of thousands of pounds.  
He was a very convincing liar.

11b.

Nigel was taken in by everything that Matt had said.  
Matt had managed to trick him out of thousands of pounds.  
He was a very gullible person.

12a.

Alice was giving Emma some advice on getting a job.  
Emma hoped that she would offer to write a job reference.  
She needed it for a job interview.

12b.

Alice was giving Emma some advice on getting a job.  
Emma hoped that she would offer to write a job reference.  
She would write a really good one.

13a.

Ian was furious after finding that the stereo bought from Ben was stolen.  
Ben was really worried that he would inform the police.  
He hastily offered a full refund.

13b.

Ian was furious after finding that the stereo bought from Ben was stolen.  
Ben was really worried that he would inform the police.  
He insisted on having a refund.

14a.

Cathy asked to use Sara's computer for a few days.  
Sara agreed that she could borrow it for a while.  
She had now finished using it.

14b.

Cathy asked to use Sara's computer for a few days.  
Sara agreed that she could borrow it for a while.  
She promised to return it soon.

15a.

Steve continued to pester Andy for more after-hours drinks.  
Andy said that he couldn't have any more.  
He should have closed at midnight.

15b.

Steve continued to pester Andy for more after-hours drinks.  
Andy said that he couldn't have any more.  
He asked for one final drink.

16a.

Sue had offered to fix Liz's car for £300.  
Liz was pleased to hear that she could start the work soon.  
She needed it repairing straight away.

16b.

Sue had offered to fix Liz's car for £300.  
Liz was pleased to hear that she could start the work soon.  
She offered to repair it immediately.

17a.

Max had fruitlessly tried for months to teach the guitar to Tom.  
Tom suspected that he was teaching the wrong things.  
He still couldn't play a single note.

17b.

Max had fruitlessly tried for months to teach the guitar to Tom.  
Tom suspected that he was teaching the wrong things.  
He taught from an old instruction manual.

18a.

Becky played at hide-and-seek outside with Fiona.  
Fiona ran off to hide where she wouldn't look.  
She decided to crouch behind some bushes.

18b.

Becky played at hide-and-seek outside with Fiona.  
Fiona ran off to hide where she wouldn't look.  
She wouldn't think to search the bushes.

19a.

Anne got an invitation to watch Vicky play tennis.  
Vicky performed so well that she was really glad to get invited.  
She had played some beautiful shots.

19b.

Anne got an invitation to watch Vicky play tennis.  
Vicky performed so well that she was really glad to get invited.  
She had enjoyed watching the match.

20a.

Jim had yet again cheated Bob at poker.  
Bob suspected that he might be up to something underhand.  
He kept losing every single game.

20b.

Jim had yet again cheated Bob at poker.  
Bob suspected that he might be up to something underhand.  
He kept winning every single game.

## ***Materials used in Experiment 6***

The versions of the texts were as follows:

The second, state sentence has the Stimulus-Experiencer order. The third, target sentence contains a pronoun referring to the Stimulus.



The second, state sentence has the Stimulus-Experiencer order. The third, target sentence contains a pronoun referring to the Experiencer.

The second, state sentence has the Experiencer-Stimulus order. The third, target sentence contains a pronoun referring to the Stimulus.

The second, state sentence has the Experiencer-Stimulus order. The third, target sentence contains a pronoun referring to the Experiencer.

1a.

Dean was mugged by Steve in the side alley.

Steve frightened Dean because he was holding a knife.

He wasn't afraid to use it.

1b.

Dean was mugged by Steve in the side alley.

Steve frightened Dean because he was holding a knife.

He was afraid of getting hurt.

1c.

Dean was mugged by Steve in the side alley.

Steve despised Dean because he looked so wealthy and posh.

He quickly made a grab for the jewellery.

1d.

Dean was mugged by Steve in the side alley.

Steve despised Dean because he looked so wealthy and posh.

He was forced to hand over the jewellery.

2a.

Julie always behaved badly during Miss Taylor's lessons.

Miss Taylor frightened Julie because she looked very angry.

She threatened to give out extra work.

2b.

Julie always behaved badly during Miss Taylor's lessons.

Miss Taylor frightened Julie because she looked very angry.

She was given two weeks of detention.

2c.

Julie always behaved badly during Miss Taylor's lessons.

Miss Taylor hated Julie because she could be so disruptive.

She thought about sending for the Head.

2d.

Julie always behaved badly during Miss Taylor's lessons.

Miss Taylor hated Julie because she could be so disruptive.

She didn't study and always arrived late.

3a.

Peter had a huge disagreement with John at work yesterday.

John irritated Peter because he had taken ten coffee breaks.

He promised not to take so many.

3b.

Peter had a huge disagreement with John at work yesterday.

John irritated Peter because he had taken ten coffee breaks.

He reported the matter to the boss.

3c.

Peter had a huge disagreement with John at work yesterday.

John loathed Peter because he was always late.

He would report the lateness to the boss.

3d.

Peter had a huge disagreement with John at work yesterday.

John loathed Peter because he was always late.

He quickly promised to arrive on time tomorrow.

4a.

Jenny had sold Emma a second hand car last week.

Emma annoyed Jenny because she refused to pay the asking price.

She couldn't afford such a large amount.

4b.

Jenny had sold Emma a second hand car last week.  
Emma annoyed Jenny because she refused to pay the asking price.  
She agreed to slightly reduce the cost.

4c.

Jenny had sold Emma a second hand car last week.  
Emma distrusted Jenny because she had lied about the service history.  
She wanted a full refund.

4d.

Jenny had sold Emma a second hand car last week.  
Emma distrusted Jenny because she had lied about the service history.  
She offered to repair it.

5a.

Tony went to see William in hospital the other day.  
William impressed Tony because he had shown such courage.  
He had very nearly died.

5b.

Tony went to see William in hospital the other day.  
William impressed Tony because he had shown such courage.  
He was happy to visit.

5c.

Tony went to see William in hospital the other day.  
William liked Tony because he was always brought something to eat.  
He tucked into the box of chocolates.

5d.

Tony went to see William in hospital the other day.  
William liked Tony because he was always brought something to eat.  
He handed over a bunch of grapes.

6a.

Angela had just recently sold Sharon a broken computer.  
Sharon alarmed Angela because she threatened to inform the police.  
She demanded a brand new machine.

6b.

Angela had just recently sold Sharon a broken computer.  
Sharon alarmed Angela because she threatened to inform the police.  
She offered to fix it immediately.

6c.

Angela had just recently sold Sharon a broken computer.  
Sharon mistrusted Angela because she had said that it worked properly.  
She insisted on a replacement machine.

6d.

Angela had just recently sold Sharon a broken computer.  
Sharon mistrusted Angela because she had said that it worked properly.  
She offered to exchange the machine.

7a.

David interviewed Trevor at the police station all through the night.  
Trevor infuriated David because he was not telling the truth.  
He was lying about the burglaries.

7b.

David interviewed Trevor at the police station all through the night.  
Trevor infuriated David because he was not telling the truth.  
He tried another line of questioning.

7c.

David interviewed Trevor at the police station all through the night.  
Trevor detested David because he was a police officer.  
He decided not to co-operate.

7d.

David interviewed Trevor at the police station all through the night.  
Trevor detested David because he was a police officer.  
He had made the arrest.

8a.  
Emma and Amanda always shopped in the town centre on Saturdays.  
Amanda bored Emma because she spent a lot of time in bookshops.  
She was a really keen reader.

8b.  
Emma and Amanda always shopped in the town centre on Saturdays.  
Amanda bored Emma because she spent a lot of time in bookshops.  
She liked sports shops more instead.

8c.  
Emma and Amanda always shopped in the town centre on Saturdays.  
Amanda envied Emma because she got £30 a week pocket money.  
She could not afford to buy anything.

8d.  
Emma and Amanda always shopped in the town centre on Saturdays.  
Amanda envied Emma because she got £30 a week pocket money.  
She could afford to buy almost anything.

9a.  
Frank met James at the pub for lunch every Sunday.  
James bored Frank because he was so dull and repetitive.  
He talked about the same old things.

9b.  
Frank met James at the pub for lunch every Sunday.  
James bored Frank because he was so dull and repetitive.  
He just stopped listening after a while.

9c.  
Frank met James at the pub for lunch every Sunday.  
James disapproved of Frank because he always got really drunk.  
He only ever had orange juice.

9d.  
Frank met James at the pub for lunch every Sunday.  
James disapproved of Frank because he always got really drunk.  
He didn't know when to stop.

10a.  
John was on the opposite team to Bill at the football match.  
Bill amazed John because he was a brilliant player.  
He was so skillful and talented.

10b.  
John was on the opposite team to Bill at the football match.  
Bill amazed John because he was a brilliant player.  
He dreamed of being as skillful.

10c.  
John was on the opposite team to Bill at the football match.  
Bill disliked John because he always committed nasty fouls.  
He did not want to get hurt.

10d.  
John was on the opposite team to Bill at the football match.  
Bill disliked John because he always committed nasty fouls.  
He was not a very fair player.

11a.  
Anne worked twice a week as Sue's housekeeper.  
Sue delighted Anne because she paid such high wages.  
She had offered sixty pounds.

11b.  
Anne worked twice a week as Sue's housekeeper.  
Sue delighted Anne because she paid such high wages.  
She really needed the money.

11c.  
Anne worked twice a week as Sue's housekeeper.  
Sue appreciated Anne because she would work so hard.  
She needed the help.

11d.

Anne worked twice a week as Sue's housekeeper.  
Sue appreciated Anne because she would work so hard.  
She enjoyed the job.

12a.

Chris rushed around to Mark's new house to fix the water leak.  
Mark worried Chris because he had already flooded the bathroom.  
He would have to buy a new carpet.

12b.

Chris rushed around to Mark's new house to fix the water leak.  
Mark worried Chris because he had already flooded the bathroom.  
He might not be able to repair it.

12c.

Chris rushed around to Mark's new house to fix the water leak.  
Mark respected Chris because he was so good at DIY.  
He wasn't very good at such things.

12d.

Chris rushed around to Mark's new house to fix the water leak.  
Mark respected Chris because he was so good at DIY.  
He fixed it within a few minutes.

13a.

Ruth had been staying in Jane's spare bedroom for a fortnight.  
Jane pleased Ruth because she didn't want much rent money.  
She only asked for a small amount.

13b.

Ruth had been staying in Jane's spare bedroom for a fortnight.  
Jane pleased Ruth because she didn't want much rent money.  
She could not afford a hotel room.

13c.

Ruth had been staying in Jane's spare bedroom for a fortnight.  
Jane pitied Ruth because she had been made homeless.  
She had enough room for two.

13d.

Ruth had been staying in Jane's spare bedroom for a fortnight.  
Jane pitied Ruth because she had been made homeless.  
She had nowhere else to stay.

14a.

Phil knocked at Alan's front door early this morning.  
Alan annoyed Phil because he did not answer.  
He tried to ignore the knocking.

14b.

Phil knocked at Alan's front door early this morning.  
Alan annoyed Phil because he did not answer.  
He decided to try again later.

14c.

Phil knocked at Alan's front door early this morning.  
Alan detested Phil because he was such a noisy neighbour.  
He finally went to answer the door.

14d.

Phil knocked at Alan's front door early this morning.  
Alan detested Phil because he was such a noisy neighbour.  
He continued to knock again and again.

15a.

Jason questioned Mark about the armed robbery on the jewellery store.  
Mark angered Jason because he was obviously lying in court.  
He had decided to plead not guilty.

15b.

Jason questioned Mark about the armed robbery on the jewellery store.  
Mark angered Jason because he was obviously lying in court.  
He decided to call in the witness.

15c.

Jason questioned Mark about the armed robbery on the jewellery store.  
Mark feared Jason because he was known for being an excellent barrister.  
He didn't want to be jailed.

15d.

Jason questioned Mark about the armed robbery on the jewellery store.  
Mark feared Jason because he was known for being an excellent barrister.  
He had never lost a case.

16a.

Claire accused Becky of stealing from the corner shop.  
Becky angered Claire because she had tried to take something once before.  
She escaped through the back door.

16b.

Claire accused Becky of stealing from the corner shop.  
Becky angered Claire because she had tried to take something once before.  
She quickly phoned the police station.

16c.

Claire accused Becky of stealing from the corner shop.  
Becky disliked Claire because she was always blaming the children for something.  
She quickly hurried out of the shop.

16d.

Claire accused Becky of stealing from the corner shop.  
Becky disliked Claire because she was always blaming the children for something.  
She was clearly very angry this time.

17a.

David was up before Keith in the courtroom.  
Keith worried David because he usually gave out harsh sentences.  
He would ignore a plea for leniency.

17b.

David was up before Keith in the courtroom.  
Keith worried David because he usually gave out harsh sentences.  
He suddenly tried to make an escape.

17c.

David was up before Keith in the courtroom.  
Keith resented David because he showed no remorse for the crime.  
He gave a very harsh sentence.

17d.

David was up before Keith in the courtroom.  
Keith resented David because he showed no remorse for the crime.  
He was sentenced to five years.

18a.

Rachael was moaning and shouting at Joanne the other day.  
Joanne soothed Rachael because she really hated having arguments.  
She was very passive and friendly.

18b.

Rachael was moaning and shouting at Joanne the other day.  
Joanne soothed Rachael because she really hated having arguments.  
She calmed down after a while.

18d.

Rachael was moaning and shouting at Joanne the other day.  
Joanne tolerated Rachael because she had recently had a lot of bad luck.  
She tried to be supportive.

18c.

Rachael was moaning and shouting at Joanne the other day.  
Joanne tolerated Rachael because she had recently had a lot of bad luck.  
She had just been sacked.

19a.

Alec organised to meet Darren to discuss the important business deal.  
Darren angered Alec because he regularly arrived late.  
He tried to be early this time.

19b.

Alec organised to meet Darren to discuss the important business deal.  
Darren angered Alec because he regularly arrived late.  
He did not want to sit waiting.

19c.

Alec organised to meet Darren to discuss the important business deal.  
Darren distrusted Alec because he was a compulsive liar.  
He was careful not to be deceived.

19d.

Alec organised to meet Darren to discuss the important business deal.  
Darren distrusted Alec because he was a compulsive liar.  
He always twisted the truth a little.

20a.

Susan had gone through the accounts with Paula before the meeting.  
Paula valued Susan because she always helped out with other people's work.  
She was grateful for the assistance.

20b.

Susan had gone through the accounts with Paula before the meeting.  
Paula valued Susan because she always helped out with other people's work.  
She was an invaluable staff member.

20c.

Susan had gone through the accounts with Paula before the meeting.  
Paula impressed Susan because she was so good with numbers.  
She deserved a pay rise.

20d.

Susan had gone through the accounts with Paula before the meeting.  
Paula impressed Susan because she was so good with numbers.  
She was awful at Maths.

21a.

Vicky asked Heather to meet at the restaurant at 8 o'clock sharp.  
Heather shocked Vicky because she offered to pay for a night on the town.  
She never usually volunteered pay for anything.

21b.

Vicky asked Heather to meet at the restaurant at 8 o'clock sharp.  
Heather shocked Vicky because she offered to pay for a night on the town.  
She quickly agreed to the unexpected offer.

21c.

Vicky asked Heather to meet at the restaurant at 8 o'clock sharp.  
Heather disapproved of Vicky because she had only just arrived at 9:30.  
She complained about the time.

21d.

Vicky asked Heather to meet at the restaurant at 8 o'clock sharp.  
Heather disapproved of Vicky because she had only just arrived at 9:30.  
She apologised and sat down.

22a.

Ian was behind the bar serving Bill another drink.  
Bill aggravated Ian because he wanted finish work and get home.  
He kept on asking for more beer.

22b.

Ian was behind the bar serving Bill another drink.  
Bill aggravated Ian because he wanted finish work and get home.  
He should have closed an hour ago.

22c.

Ian was behind the bar serving Bill another drink.  
Bill feared Ian because he became quite aggressive and angry.  
He threatened to phone the police.

22d.

Ian was behind the bar serving Bill another drink.  
Bill feared Ian because he became quite aggressive and angry.  
He had suddenly got really nasty.

23a.

Paul was talking to Bob at the party the previous Saturday.  
Bob bored Paul because he never had anything interesting to say.  
He was telling yet another dull story.

23b.

Paul was talking to Bob at the party the previous Saturday.  
Bob bored Paul because he never had anything interesting to say.  
He made an excuse and quickly left.

23c.

Paul was talking to Bob at the party the previous Saturday.  
Bob appreciated Paul because he was very funny and entertaining.  
He enjoyed listening to the jokes.

23d.

Paul was talking to Bob at the party the previous Saturday.  
Bob appreciated Paul because he was very funny and entertaining.  
He told so many hilarious jokes.

24a.

Robert told Henry to open the safe and hand over all the money.  
Henry infuriated Robert because he pretended that there was nothing in it.  
He didn't want to give away the money.

24b.

Robert told Henry to open the safe and hand over all the money.  
Henry infuriated Robert because he pretended that there was nothing in it.  
He became angry and pulled out a gun.

24c.

Robert told Henry to open the safe and hand over all the money.  
Henry feared Robert because he was holding up a gun.  
He quickly handed over all the cash.

24d.

Robert told Henry to open the safe and hand over all the money.  
Henry feared Robert because he was holding up a gun.  
He threatened to use it if necessary.

## ***Materials used in Experiment 7***

The versions of the texts were as follows:

The second, state sentence has the Stimulus-Experiencer order. The pronoun in the *because* clause refers to the Stimulus.  
The second, state sentence has the Stimulus-Experiencer order. The pronoun in the *because* clause refers to the Experiencer.

The second, state sentence has the Experiencer-Stimulus order. The pronoun in the *because* clause refers to the Stimulus.  
The second, state sentence has the Experiencer-Stimulus order. The pronoun in the *because* clause refers to the Experiencer.

The second sentence has a main clause with no implicit causality. The pronoun in the *because* clause refers to the non-subject in the main clause.

The second sentence has a main clause with no implicit causality. The pronoun in the *because* clause refers to the non-subject in the main clause.

1a.

Kate tried to revise but Lynn was playing music.  
Lynn began to aggravate Kate because she had it at full volume.

1b.

Kate tried to revise but Lynn was playing music.  
Lynn began to aggravate Kate because she had an exam on Monday.

2a.

Bill lost hundreds of pounds in John's confidence scam.  
John had managed to deceive Bill because he could be a very convincing liar.

2b.

Bill lost hundreds of pounds in John's confidence scam.  
John had managed to deceive Bill because he could be very gullible at times.

- 3a.  
Liz looked up and saw Sue bleeding very badly.  
Sue succeeded in terrifying Liz because she seemed to be quite seriously hurt.
- 3b.  
Liz looked up and saw Sue bleeding very badly.  
Sue succeeded in terrifying Liz because she couldn't stand the sight of blood.
- 4a.  
Paul felt extremely jealous of Jack's huge pay rise.  
Jack really annoyed Paul because he earned twice as much for the same job.
- 4b.  
Paul felt extremely jealous of Jack's huge pay rise.  
Jack really annoyed Paul because he earned half as much for the same job.
- 5a.  
Ruth sat and listened to Jane's latest musical composition.  
Jane's talent for music amazed Ruth because she could play dozens of instruments.
- 5b.  
Ruth sat and listened to Jane's latest musical composition.  
Jane's talent for music amazed Ruth because she could not play any instruments.
- 6a.  
Pete had interviewed Dave for the top job.  
Dave must have impressed Pete because he was offered the job immediately.
- 6b.  
Pete had interviewed Dave for the top job.  
Dave must have impressed Pete because he offered a very high salary.
- 7a.  
Jill was overjoyed with the surprise get-together Mary organised.  
Mary really did surprise Jill because she managed to arrange things in secret.
- 7b.  
Jill was overjoyed with the surprise get-together Mary organised.  
Mary really did surprise Jill because she had not been expecting any party.
- 8a.  
Phil was the doctor assigned to treat Dean.  
Dean's condition really worried Phil because he was having trouble trying to breathe.
- 8b.  
Phil was the doctor assigned to treat Dean.  
Dean's condition really worried Phil because he could not diagnose what was wrong.
- 9c.  
Linda was by far the richest person Jenny knew.  
Jenny had always been extremely envious of Linda because she always had plenty of money.
- 9d.  
Linda was by far the richest person Jenny knew.  
Jenny had always been extremely envious of Linda because she would never be as wealthy.
- 10c.  
Ian volunteered to write a reference for the job Mark had applied for.  
Mark really did value Ian's offer to write it because he could write a really good one.
- 10d.  
Ian volunteered to write a reference for the job Mark had applied for.  
Mark really did value Ian's offer to write it because he needed one for the job interview.
- 11c.  
Sara escaped with the shop's takings after cornering Julie.  
Julie must have been terrified of Sara because she was waving a large knife around.
- 11d.  
Sara escaped with the shop's takings after cornering Julie.  
Julie must have been terrified of Sara because she handed over the money at once.
- 12c.  
Steve had been planning to beat up Andy at playtime.  
Andy really did distrust Steve because he was notorious for being a bully.



12d.

Steve had been planning to beat up Andy at playtime.

Andy really did distrust Steve because he had heard rumours about the fight.

13c.

Becky boasted to Alice about getting top marks again in the test.

Alice was resentful of Becky because she never scored below 90% in them.

13d.

Becky boasted to Alice about getting top marks again in the test.

Alice was resentful of Becky because she never scored above 50% in them.

14c.

Ben came to try and repair Jim's car.

Jim really did appreciate Ben helping out because he knew everything about fixing cars.

14d.

Ben came to try and repair Jim's car.

Jim really did appreciate Ben helping out because he knew nothing about car mechanics.

15c.

Helen had once cheated Tina out of £100 when playing cards.

Tina had since begun to distrust Helen because she had managed to win every single hand.

15d.

Helen had once cheated Tina out of £100 when playing cards.

Tina had since begun to distrust Helen because she had managed to lose every single hand.

16c.

Max played in the first live football game Fred had seen.

Fred now thoroughly admired Max because he had played some really superb shots.

16d.

Max played in the first live football game Fred had seen.

Fred now thoroughly admired Max because he had really enjoyed watching the game.

17c.

Emma checked the car's oil while Cathy got some refreshments.

Cathy poured a drink for Emma because she had got clean hands.

17f.

Emma checked the car's oil while Cathy got some refreshments.

Cathy poured a drink for Emma because she had got dirty hands.

18e.

Colin gave the finished essay to Gary to double-check some things.

Gary edited it for Colin because he was much better at spelling.

18f.

Colin gave the finished essay to Gary to double-check some things.

Gary edited it for Colin because he was really bad at spelling.

19c.

Katie opened some wine when Sally served-up their meal.

Sally always cooked dinner for Katie because she was good in the kitchen.

19f.

Katie opened some wine when Sally served-up their meal.

Sally always cooked dinner for Katie because she was useless in the kitchen.

20c.

Tony would be a little late when meeting Scott today.

Scott waited to see Tony because he would not be waiting for long.

20f.

Tony would be a little late when meeting Scott today.

Scott waited to see Tony because he should be here at any moment.

21c.

Suzy raced down the hill on the bicycle towards Fiona.

Fiona pointed the camera at Suzy because she just knew something would happen.

21f.

Suzy raced down the hill on the bicycle towards Fiona.

Fiona pointed the camera at Suzy because she would make a great photograph.

22e.

Tim was ambushed by Bert while playing at soldiers.  
Bert quickly aimed the gun at Tim because he had a clear shot.

22f.

Tim was ambushed by Bert while playing at soldiers.  
Bert quickly aimed the gun at Tim because he tried to get away.

23e.

Laura thanked Dianne for the wonderful Christmas present.  
Dianne had made a jumper for Laura because she was good at knitting.

23f.

Laura thanked Dianne for the wonderful Christmas present.  
Dianne had made a jumper for Laura because she asked for a new one.

24e.

Neil invited Leo to the birthday party this Saturday night.  
Leo searched for a nice gift for Neil because he wanted to give something special.

24f.

Neil invited Leo to the birthday party this Saturday night.  
Leo searched for a nice gift for Neil because he would be twenty-one this year.

25e.

Lucy sneaked out of the room with Paula's money.  
Paula tried to catch Lucy because she noticed that it was gone.

25f.

Lucy sneaked out of the room with Paula's money.  
Paula tried to catch Lucy because she had been seen taking it.

26e.

Tom frantically asked for Alan's help repairing the burst pipe.  
Alan attempted to fix the pipe for Tom because he knew a lot about plumbing.

26f.

Tom frantically asked for Alan's help repairing the burst pipe.  
Alan attempted to fix the pipe for Tom because he needed it fixing straight away.

27e.

Rose asked Marie to help translate the letter from Germany.  
Marie read the letter to Rose because she could speak fluent German.

27f.

Rose asked Marie to help translate the letter from Germany.  
Marie read the letter to Rose because she could not understand German.

28e.

Tony had got Matt to cover at work for a week.  
Matt took over the shift for Tony because he needed the extra money.

28f.

Tony had got Matt to cover at work for a week.  
Matt took over the shift for Tony because he really needed a holiday.

29e.

Lisa modelled for Beth's picture.  
Beth was painting a portrait of Lisa because she wanted to practise using oils.

29f.

Lisa modelled for Beth's picture.  
Beth was painting a portrait of Lisa because she could sit motionless for hours.

30e.

Ray was glad that Ken now did the bookkeeping instead.  
Ken took over the accounts from Ray because he had a good head for figures.

30f.

Ray was glad that Ken now did the bookkeeping instead.  
Ken took over the accounts from Ray because he had a terrible head for figures.

31e.

Pam's lead against Claire in the race had fallen dramatically.  
Claire tried to catch Pam because she was now only seconds behind.

31f.

Pam's lead against Claire in the race had fallen dramatically.  
Claire tried to catch Pam because she was now only seconds ahead.

32e.

Keith met Bob for a lunchtime game of tennis.  
Bob managed to find a pair of shoes for Keith because he always kept a spare pair handy.

32f.

Keith met Bob for a lunchtime game of tennis.  
Bob managed to find a pair of shoes for Keith because he always kept a spare pair handy.

## ***Materials used in Experiment 8***

The versions of the texts were as follows:

The second, state sentence has the Stimulus-Experiencer order. The pronoun in the *because* clause refers to the Stimulus.  
The third, target sentence contains a pronoun referring to the Stimulus.

The second, state sentence has the Stimulus-Experiencer order. The pronoun in the *because* clause refers to the Stimulus.  
The third, target sentence contains a pronoun referring to the Experiencer.

The second, state sentence has the Stimulus-Experiencer order. The pronoun in the *because* clause refers to the Experiencer. The third, target sentence contains a pronoun referring to the Stimulus.

The second, state sentence has the Stimulus-Experiencer order. The pronoun in the *because* clause refers to the Experiencer. The third, target sentence contains a pronoun referring to the Experiencer.

The second, state sentence has the Experiencer-Stimulus order. The pronoun in the *because* clause refers to the Stimulus.  
The third, target sentence contains a pronoun referring to the Stimulus.

The second, state sentence has the Experiencer-Stimulus order. The pronoun in the *because* clause refers to the Stimulus.  
The third, target sentence contains a pronoun referring to the Experiencer.

The second, state sentence has the Experiencer-Stimulus order. The pronoun in the *because* clause refers to the Experiencer. The third, target sentence contains a pronoun referring to the Stimulus.

The second, state sentence has the Experiencer-Stimulus order. The pronoun in the *because* clause refers to the Experiencer. The third, target sentence contains a pronoun referring to the Experiencer.

1a.

John constantly got put down by Bill.  
Bill annoyed John because he never stopped being cruel.  
He could be really quite nasty.

1b.

John constantly got put down by Bill.  
Bill annoyed John because he never stopped being cruel.  
He was always treated very badly.

1c.

John constantly got put down by Bill.  
Bill annoyed John because he hated being humiliated like this.  
He could be really quite nasty.

1d.

John constantly got put down by Bill.  
Bill annoyed John because he hated being humiliated like this.  
He was always treated very badly.

2a.

Laura would never trust Marie any more.  
Marie infuriated Laura because she lied constantly.  
She had broken the promise again.

2b.

Laura would never trust Marie any more.  
Marie infuriated Laura because she lied constantly.  
She had been conned yet again.

2c.

Laura would never trust Marie any more.  
Marie infuriated Laura because she hated being deceived.  
She had broken the promise again.

2d.

Laura would never trust Marie any more.  
Marie infuriated Laura because she hated being deceived.  
She had been conned yet again.

3a.

Paul noticed Neil sitting alone in the corner.  
Neil troubled Paul because he looked deeply upset.  
He had been crying for a while.

3b.

Paul noticed Neil sitting alone in the corner.  
Neil troubled Paul because he looked deeply upset.  
He went to see what was wrong.

3c.

Paul noticed Neil sitting alone in the corner.  
Neil troubled Paul because he hated others looking sad.  
He had been crying for a while.

3d.

Paul noticed Neil sitting alone in the corner.  
Neil troubled Paul because he hated others looking sad.  
He went to see what was wrong.

4a.

Kate thought Lynn should get a prize for doing so well at school.  
Lynn impressed Kate because she'd easily come top in every class.  
She had achieved excellent results.

4b.

Kate thought Lynn should get a prize for doing so well at school.  
Lynn impressed Kate because she'd easily come top in every class.  
She really admired academic achievement.

4c.

Kate thought Lynn should get a prize for doing so well at school.  
Lynn impressed Kate because she was in awe of intellectual ability.  
She had achieved excellent results.

4d.

Kate thought Lynn should get a prize for doing so well at school.  
Lynn impressed Kate because she was in awe of intellectual ability.  
She really admired academic achievement.

5a.

Peter was accosted by David outside the bank.  
David terrified Peter because he looked utterly menacing.  
He was waving a huge knife around.

5b.

Peter was accosted by David outside the bank.  
David terrified Peter because he looked utterly menacing.  
He was waving a huge knife around.

5c.

Peter was accosted by David outside the bank.  
David terrified Peter because he was afraid of getting hurt.  
He quickly tried to make an escape.

5d.

Peter was accosted by David outside the bank.  
David terrified Peter because he was afraid of getting hurt.  
He quickly tried to make an escape.

6a.

Sally had jumped at the chance to work for Emma.  
Emma delighted Sally because she paid such good wages.  
She had offered to pay double the salary.

6b.

Sally had jumped at the chance to work for Emma.  
Emma delighted Sally because she paid such good wages.  
She had offered to pay double the salary.

6c.

Sally had jumped at the chance to work for Emma.  
Emma delighted Sally because she would receive far higher wages.  
She got a better overtime rate as well.

6d.

Sally had jumped at the chance to work for Emma.  
Emma delighted Sally because she would receive far higher wages.  
She got a better overtime rate as well.

7a.

Henry convicted Derek for committing the armed robbery.  
Derek angered Henry because he showed no remorse for the crime.  
He was given the maximum sentence.

7b.

Henry convicted Derek for committing the armed robbery.  
Derek angered Henry because he showed no remorse for the crime.  
He gave out the maximum sentence.

7c.

Henry convicted Derek for committing the armed robbery.  
Derek angered Henry because he especially hated violent criminals.  
He was given the maximum sentence.

7d.

Henry convicted Derek for committing the armed robbery.  
Derek angered Henry because he especially hated violent criminals.  
He gave out the maximum sentence.

8a.

Lisa got caught eating sweets during Gail's Maths lesson.  
Gail worried Lisa because she looked extremely angry.  
She threatened to give out extra work.

8b.

Lisa got caught eating sweets during Gail's Maths lesson.  
Gail worried Lisa because she looked extremely angry.  
She was given two weeks of detention.

8c.

Lisa got caught eating sweets during Gail's Maths lesson.  
Gail worried Lisa because she was going to be in trouble.  
She threatened to give out extra work.

8d.

Lisa got caught eating sweets during Gail's Maths lesson.  
Gail worried Lisa because she was going to be in trouble.  
She was given two weeks of detention.

9a.

Steve played against Frank in the local needle match.  
Frank humiliated Steve because he was winning so easily.  
He always won the local derby.

9b.

Steve played against Frank in the local needle match.  
Frank humiliated Steve because he was winning so easily.  
He never won the local derby.

9c.

Steve played against Frank in the local needle match.  
Frank humiliated Steve because he was being beaten so easily.  
He always won the local derby.

9d.

Steve played against Frank in the local needle match.  
Frank humiliated Steve because he was being beaten so easily.  
He never won the local derby.

10a.

Julie was always getting tricked by Susan.  
Susan deceived Julie because she was so cunning.  
She was incredibly dishonest.

10b.

Julie was always getting tricked by Susan.  
Susan deceived Julie because she was so cunning.  
She was unbelievably naive.

10c.

Julie was always getting tricked by Susan.  
Susan deceived Julie because she was far too trusting.  
She was incredibly dishonest.

10d.

Julie was always getting tricked by Susan.  
Susan deceived Julie because she was far too trusting.  
She was unbelievably naive.

11a.

Phil couldn't originally afford to buy the motorcycle from Mark.  
Mark delighted Phil because he agreed to lower the price.  
He just wanted to sell it quickly.

11b.

Phil couldn't originally afford to buy the motorcycle from Mark.  
Mark delighted Phil because he agreed to lower the price.  
He could now afford to buy it.

11c.

Phil couldn't originally afford to buy the motorcycle from Mark.  
Mark delighted Phil because he was offered a discount.  
He just wanted to sell it quickly.

11d.

Phil couldn't originally afford to buy the motorcycle from Mark.  
Mark delighted Phil because he was offered a discount.  
He could now afford to buy it.

12a.

Sue complained about Liz chatting in the library.  
Liz irritated Sue because she was being really noisy.  
She was disrupting everyone's revision.

12b.

Sue complained about Liz chatting in the library.  
Liz irritated Sue because she was being really noisy.  
She was constantly getting disrupted.

12c.

Sue complained about Liz chatting in the library.  
Liz irritated Sue because she was constantly being disturbed.  
She was disrupting everyone's revision.

12d.

Sue complained about Liz chatting in the library.  
Liz irritated Sue because she was constantly being disturbed.  
She was constantly getting disrupted.

13a.

Ian somehow kept losing to Bob while playing poker.  
Bob deceived Ian because he had secretly marked the cards.  
He had now won almost a hundred pounds.

13b.

Ian somehow kept losing to Bob while playing poker.  
Bob deceived Ian because he had secretly marked the cards.  
He had now lost almost a hundred pounds.

13c.

Ian somehow kept losing to Bob while playing poker.  
Bob deceived Ian because he had no idea the cards were marked.  
He had now won almost a hundred pounds.

13d.

Ian somehow kept losing to Bob while playing poker.  
Bob deceived Ian because he had no idea the cards were marked.  
He had now lost almost a hundred pounds.

14a.

Anne had really wanted Jane to do well.  
Jane disappointed Anne because she had put in too little effort.  
She was capable of so much more.

14b.

Anne had really wanted Jane to do well.  
Jane disappointed Anne because she had put in too little effort.  
She had expected a great deal more.

14c.

Anne had really wanted Jane to do well.  
Jane disappointed Anne because she had very high standards.  
She was capable of so much more.

14d.

Anne had really wanted Jane to do well.  
Jane disappointed Anne because she had very high standards.  
She had expected a great deal more.

15a.

Tony watched Mike's comedy act intently.  
Mike amused Tony because he was extremely funny.  
He could do superb impressions.

15b.

Tony watched Mike's comedy act intently.  
Mike amused Tony because he was extremely funny.  
He liked hearing good impressions.

15c.

Tony watched Mike's comedy act intently.  
Mike amused Tony because he was easily entertained.  
He could do superb impressions.

15d.

Tony watched Mike's comedy act intently.  
Mike amused Tony because he was easily entertained.  
He liked hearing good impressions.

16a.

Ruth found Beth unconscious in a pool of blood.  
Beth worried Ruth because she seemed to be seriously hurt.  
She must have been hit in the shooting.

16b.

Ruth found Beth unconscious in a pool of blood.  
Beth worried Ruth because she seemed to be seriously hurt.  
She quickly ran to call for an ambulance.

16c.

Ruth found Beth unconscious in a pool of blood.  
Beth worried Ruth because she was scared of what would happen.  
She had been hit in the shooting.

16d.

Ruth found Beth unconscious in a pool of blood.  
Beth worried Ruth because she was scared of what would happen.  
She quickly ran to call an ambulance.

17e.

Colin stared at Jason in a threatening manner.  
Jason feared Colin because he could be very aggressive.  
He had a reputation for fighting.

17f.

Colin stared at Jason in a threatening manner.  
Jason feared Colin because he could be very aggressive.  
He had always been very timid.

17g.

Colin stared at Jason in a threatening manner.  
Jason feared Colin because he was frightened of bullies.  
He had a reputation for fighting.

17h.

Colin stared at Jason in a threatening manner.  
Jason feared Colin because he was frightened of bullies.  
He had always been very timid.

18e.

Alice boasted to Becky about the huge lottery win.  
Becky envied Alice because she had just won the jackpot.  
She was now a multi-millionaire.

18f.

Alice boasted to Becky about the huge lottery win.  
Becky envied Alice because she had just won the jackpot.  
She was always short of money.

18g.

Alice boasted to Becky about the huge lottery win.  
Becky envied Alice because she was very jealous.  
She was now a multi-millionaire.

18h.

Alice boasted to Becky about the huge lottery win.  
Becky envied Alice because she was very jealous.  
She was always short of money.

19e.

Keith agreed to help Scott move into the new flat.  
Scott appreciated Keith because he had offered to help.  
He would be extremely helpful.

19f.

Keith agreed to help Scott move into the new flat.  
Scott appreciated Keith because he had offered to help.  
He couldn't have managed alone.

19g.

Keith agreed to help Scott move into the new flat.  
Scott appreciated Keith because he needed the extra help.  
He would be extremely helpful.

19h.

Keith agreed to help Scott move into the new flat.  
Scott appreciated Keith because he needed the extra help.  
He couldn't have managed alone.

20e.

Tina offered to put Mary up in the spare room.  
Mary liked Tina because she was incredibly hospitable.  
She enjoyed having guests over to stay.

20f.

Tina offered to put Mary up in the spare room.  
Mary liked Tina because she was incredibly hospitable.  
She appreciated the bed for the night.

20g.

Tina offered to put Mary up in the spare room.  
Mary liked Tina because she was made to feel at home.  
She enjoyed having guests over to stay.

20h.

Tina offered to put Mary up in the spare room.  
Mary liked Tina because she was made to feel at home.  
She appreciated the bed for the night.

21e.

Tim was again in a drunken state when meeting Roy.  
Roy disapproved of Tim because he always drank too much.  
He would be drunk every single night.

21f.

Tim was again in a drunken state when meeting Roy.  
Roy disapproved of Tim because he always drank too much.  
He had always been a bit puritanical.

21g.

Tim was again in a drunken state when meeting Roy.  
Roy disapproved of Tim because he was a very disapproving person.  
He would be drunk every single night.



21h.

Tim was again in a drunken state when meeting Roy.  
Roy disapproved of Tim because he was a very disapproving person.  
He had always been a bit puritanical.

22e.

Cathy never told the truth to Donna.  
Donna resented Cathy because she was completely unreliable.  
She seemed to lie constantly.

22f.

Cathy never told the truth to Donna.  
Donna resented Cathy because she was completely unreliable.  
She felt quite badly betrayed.

22g.

Cathy never told the truth to Donna.  
Donna resented Cathy because she'd been deceived.  
She seemed to lie constantly.

22h.

Cathy never told the truth to Donna.  
Donna resented Cathy because she'd been deceived.  
She felt quite badly betrayed.

23e.

Fred tried to make Jack laugh with some new jokes.  
Jack appreciated Fred because he was being very entertaining.  
He could really make people laugh.

23f.

Fred tried to make Jack laugh with some new jokes.  
Jack appreciated Fred because he was being very entertaining.  
He really enjoyed listening to them.

23g.

Fred tried to make Jack laugh with some new jokes.  
Jack appreciated Fred because he was easily entertained.  
He could really make people laugh.

23h.

Fred tried to make Jack laugh with some new jokes.  
Jack appreciated Fred because he was easily entertained.  
He really enjoyed listening to them.

24e.

Rose wanted Jill's advice about getting a divorce.  
Jill pitied Rose because she'd had lots of bad luck recently.  
She needed someone to talk to.

24f.

Rose wanted Jill's advice about getting a divorce.  
Jill pitied Rose because she'd had lots of bad luck recently.  
She tried hard to be supportive.

24g.

Rose wanted Jill's advice about getting a divorce.  
Jill pitied Rose because she was a very sympathetic person.  
She needed someone to talk to.

24h.

Rose wanted Jill's advice about getting a divorce.  
Jill pitied Rose because she was a very sympathetic person.  
She tried hard to be supportive.

25e.

Dave had attempted to get Pete to sign over the money.  
Pete distrusted Dave because he would rarely tell the truth.  
He had clearly lied about everything.

25f.

Dave had attempted to get Pete to sign over the money.  
Pete distrusted Dave because he would rarely tell the truth.  
He decided not to sign anything.

25g.

Dave had attempted to get Pete to sign over the money.  
Pete distrusted Dave because he had almost been doublecrossed.  
He had clearly lied about everything.

25h.

Dave had attempted to get Pete to sign over the money.  
Pete distrusted Dave because he had almost been doublecrossed.  
He decided not to sign anything.

26e.

Trudy was again hours late to meet Diane.  
Diane resented Trudy because she was always late for meetings.  
She never bothered about being punctual.

26f.

Trudy was again hours late to meet Diane.  
Diane resented Trudy because she was always late for meetings.  
She complained about the constant lateness.

26g.

Trudy was again hours late to meet Diane.  
Diane resented Trudy because she hated to be kept waiting.  
She never bothered about being punctual.

26h.

Trudy was again hours late to meet Diane.  
Diane resented Trudy because she hated to be kept waiting.  
She complained about the constant lateness.

27e.

Dean was seen taking money from Jeff's wallet.  
Jeff loathed Dean because he confessed to stealing regularly.  
He could not expect any forgiveness.

27f.

Dean was seen taking money from Jeff's wallet.  
Jeff loathed Dean because he confessed to stealing regularly.  
He could not offer any forgiveness.

27g.

Dean was seen taking money from Jeff's wallet.  
Jeff loathed Dean because he disapproved of people stealing.  
He could not expect any forgiveness.

27h.

Dean was seen taking money from Jeff's wallet.  
Jeff loathed Dean because he disapproved of people stealing.  
He could not offer any forgiveness.

28e.

Mandy had problems getting Karen to understand the information.  
Karen misunderstood Mandy because she wasn't clear enough.  
She offered to clarify the statement.

28f.

Mandy had problems getting Karen to understand the information.  
Karen misunderstood Mandy because she wasn't clear enough.  
She needed clarification on some points.

28g.

Mandy had problems getting Karen to understand the information.  
Karen misunderstood Mandy because she wasn't paying attention.  
She offered to clarify the statement.

28h.

Mandy had problems getting Karen to understand the information.  
Karen misunderstood Mandy because she wasn't paying attention.  
She needed clarification on some points.

29e.

Dave remorsefully admitted to Pete about cheating.  
Pete valued Dave because he had owned up immediately.  
He had really regretted doing it.

29f.

Dave remorsefully admitted to Pete about cheating.  
Pete valued Dave because he had owned up immediately.  
He decided not to be judgmental.

29g.

Dave remorsefully admitted to Pete about cheating.  
Pete valued Dave because he knew how hard it was to confess.  
He had really regretted doing it.

29h.

Dave remorsefully admitted to Pete about cheating.  
Pete valued Dave because he knew how hard it was to confess.  
He decided not to be judgmental.

30e.

Dawn had put in a job application to be Joan's secretary.  
Joan appreciated Dawn because she would be perfect for the post.  
She was given the job without an interview.

30f.

Dawn had put in a job application to be Joan's secretary.  
Joan appreciated Dawn because she would be perfect for the post.  
She decided to offer the job straight away.

30g.

Dawn had put in a job application to be Joan's secretary.  
Joan appreciated Dawn because she'd really needed the extra help.  
She was given the job without an interview.

30h.

Dawn had put in a job application to be Joan's secretary.  
Joan appreciated Dawn because she'd really needed the extra help.  
She decided to offer the job straight away.

31e.

Andy boasted to Gary about coming top in the test again.  
Gary envied Andy because he seemed to be good at everything.  
He was always showing off too.

31f.

Andy boasted to Gary about coming top in the test again.  
Gary envied Andy because he seemed to be good at everything.  
He always felt humiliated by it.

31g.

Andy boasted to Gary about coming top in the test again.  
Gary envied Andy because he never managed to do as well.  
He was always showing off too.

31h.

Andy boasted to Gary about coming top in the test again.  
Gary envied Andy because he never managed to do as well.  
He always felt humiliated by it.

32e.

Carol constantly disturbed Janet who lived next door.  
Janet loathed Carol because she was such a noisy neighbour.  
She would play music into the early hours.

32f.

Carol constantly disturbed Janet who lived next door.  
Janet loathed Carol because she was such a noisy neighbour.  
She sometimes got woken in the early hours.

32g.

Carol constantly disturbed Janet who lived next door.  
Janet loathed Carol because she hated the constant noise.  
She would play music into the early hours.

32h.

Carol constantly disturbed Janet who lived next door.  
Janet loathed Carol because she hated the constant noise.  
She sometimes got woken in the early hours.

## *Materials used in Experiment 9*

The versions of the sentences were as follows:  
The sentence has the Goal-Source order.  
The sentence has the Source-Goal order.

1a.  
John rented the building from the council.

1b.  
John loaned the building to the council.

2a.  
Julie received the money from the airline.

2b.  
Julie sent the money to the airline.

3a.  
Colin accepted a gift from the charity.

3b.  
Colin donated a gift to charity.

4a.  
Christine stole the document from the newspaper.

4b.  
Christine sold the document to the newspaper.

5a.  
Robert collected the parcel from the post office.

5b.  
Robert delivered the parcel to the post office.

6a.  
Vicky collected the book from the book shop.

6b.  
Vicky donated the book to the book shop.

7a.  
Paul withdrew the money from the bank.

7b.  
Paul deposited the money into the bank.

8a.  
Barbara bought the clock from the factory.

8b.  
Barbara returned the clock to the factory.

9a.  
Malcolm borrowed the money from the building society.

9b.  
Malcolm transferred the money to the building society.

10a.  
Nicola collected the car from the garage.

10b.  
Nicola took the car to the garage.

11a.  
Matthew received a letter from the bank.

11b.  
Matthew posted a letter to the bank.

- 12a.  
Sarah borrowed the record from the library.
- 12b.  
Sarah returned the record to the library.
- 13a.  
Jason received the photograph from the shop.
- 13b.  
Jason sent the photograph to the shop.
- 14a.  
Diane collected the money from the church.
- 14b.  
Diane donated the money to the church.
- 15a.  
Derek rented the video from the video shop.
- 15b.  
Derek returned the video to the video shop.
- 16a.  
Sally obtained the documents from the head-office.
- 16b.  
Sally rushed the documents to the head-office.

### ***Materials used in Experiment 10***

The versions of the sentences were as follows:  
The sentence has the Goal-Source order.  
The sentence has the Source-Goal order.

- 1a.  
The council removed Tom from the nursery-school.
- 1b.  
The council reassigned Tom to the nursery-school.
- 2a.  
The corporation accepted Alice from the University.
- 2b.  
The corporation dispatched Alice to the University.
- 3a.  
The museum obtained Gary from the art gallery.
- 3b.  
The museum loaned Gary to the art gallery.
- 4a.  
The charity accepted Jane from the health authority.
- 4b.  
The charity offered Jane to the health authority.
- 5a.  
The club collected John from the hospital.
- 5b.  
The club sent John to the hospital.
- 6a.  
The college borrowed Mary from the school.
- 6b.  
The college lent Mary to the school.

- 7a.  
The firm acquired Stuart from the head-office.
- 7b.  
The firm assigned Stuart to the head-office.
- 8a.  
The shop obtained Cathy from the agency.
- 8b.  
The shop returned Cathy to the agency.
- 9a.  
The bank obtained Henry from the building-society.
- 9b.  
The bank loaned Henry to the building-society.
- 10a.  
The committee stole Kate from the organisation.
- 10b.  
The committee returned Kate to the organisation.
- 11a.  
The court received Paul from the prison.
- 11b.  
The court sent Paul to the prison.
- 12a.  
The company hired Fiona from the laboratories.
- 12b.  
The company rushed Fiona to the laboratories.
- 13a.  
The firm acquired Barry from the council.
- 13b.  
The firm rented Barry to the council.
- 14a.  
The library hired Sarah from the University.
- 14b.  
The library dispatched Sarah to the University.
- 15a.  
The supermarket borrowed Mark from the warehouse.
- 15b.  
The supermarket relocated Mark to the warehouse.
- 16a.  
The Government took Susan from the department.
- 16b.  
The Government transferred Susan to the department.

### ***Materials used in Experiment 11***

The versions of the sentences were as follows:  
The sentence has the Goal-Source order.  
The sentence has the Source-Goal order.

- 1a.  
The committee received a letter from Mary.

- 1b.  
The committee sent a letter to Mary.
- 2a.  
The shop hired a computer from Bill.
- 2b.  
The shop sold a computer to Bill.
- 3a.  
The library accepted a book from Alan.
- 3b.  
The library posted a book to Alan.
- 4a.  
The charity accepted the cash from Sharon.
- 4b.  
The charity donated the cash to Sharon.
- 5a.  
The building society withdraw a cheque from Susan.
- 5b.  
The building society issued a cheque to Susan.
- 6a.  
The garage took the car from Malcolm.
- 6b.  
The garage rented the car to Malcolm.
- 7a.  
The newspaper stole the document from Adam.
- 7b.  
The newspaper offered the document to Adam.
- 8a.  
The council confiscated the keys from Michael.
- 8b.  
The council handed the keys to Michael.
- 9a.  
The probation service received a report from Jenny.
- 9b.  
The probation service sent a report to Jenny.
- 10a.  
The airline confiscated the tickets from Timothy.
- 10b.  
The airline delivered the tickets to Timothy.
- 11a.  
The court seized the document from Emma.
- 11b.  
The court passed the document to Emma.
- 12a.  
The bank took the money from John.
- 12b.  
The bank returned the money to John.
- 13a.  
The college claimed the certificate from Angela.
- 13b.  
The college sent the certificate to Angela.

- 14a.  
The school received a letter from Joan.
- 14b.  
The school wrote a letter to Joan.
- 15a.  
The estate acquired the house from Sarah.
- 15b.  
The estate bequeathed the house to Sarah.
- 16a.  
The hospital accepted a cheque from Thomas.
- 16b.  
The hospital presented a cheque to Thomas.

## ***Materials used in Experiment 12***

The versions of the sentences were as follows:  
The sentence has the Goal-Source order.  
The sentence has the Source-Goal order.

- 1a.  
John collected Bill from the supermarket.
- 1b.  
John sent Bill to the supermarket.
- 2a.  
Malcolm collected Stuart from the library.
- 2b.  
Malcolm took Stuart to the library.
- 3a.  
Matthew collected Tony from the bus station.
- 3b.  
Matthew hurried Tony to the bus station.
- 4a.  
Robert drove Duncan from the airport.
- 4b.  
Robert drove Duncan to the airport.
- 5a.  
Vincent chased Kenneth from school.
- 5b.  
Vincent picked Kenneth up to school.
- 6a.  
Derek snatched Michael from the court.
- 6b.  
Derek delivered Michael to the court.
- 7a.  
Colin seized Gary from the authorities.
- 7b.  
Colin turned Gary over to the authorities.
- 8a.  
Jason carried Trevor from the pub.
- 8b.  
Jason directed Trevor to the pub.



- 9a.  
Julie rescued Rachel from the government.
- 9b.  
Julie handed Rachel over to the government.
- 10a.  
Nicola abducted Eleanor from the corner shop.
- 10b.  
Nicola pushed Eleanor to the corner shop.
- 11a.  
Sarah discharged Jenny from the hospital.
- 11b.  
Sarah rushed Jenny to the hospital.
- 12a.  
Vicky released Emma from the prison.
- 12b.  
Vicky sent Emma to the prison.
- 13a.  
Diane picked Angela up from the cinema.
- 13b.  
Diane took Angela to the cinema.
- 14a.  
Barbara got Brenda from the home.
- 14b.  
Barbara returned Brenda to the home.
- 15a.  
Hilda discharged Linda from the surgery.
- 15b.  
Hilda carried Linda to the surgery.
- 16a.  
Sharon kidnapped Helen from the cult.
- 16b.  
Sharon returned Helen to the cult.

### ***Materials used in Experiment 13***

The versions of the sentences were as follows:  
The sentence has the Goal-Source order.  
The sentence has the Source-Goal order.

- 1a.  
The bank accepted Mary from John.
- 1b.  
The bank sent Mary to John.
- 2a.  
The club bought Peter from Jane.
- 2b.  
The club sold Peter to Jane.
- 3a.  
The charity took Alice from Arthur.
- 3b.  
The charity gave Alice to Arthur.

- 4a.  
The school collected Thomas from Mary.
- 4b.  
The school dispatched Thomas to Mary.
- 5a.  
The government stole Edward from Loan.
- 5b.  
The government offered Edward to Loan.
- 6a.  
The court seized Brenda over from Keith.
- 6b.  
The court handed Brenda over to Keith.
- 7a.  
The probation service removed Ronald from Paula.
- 7b.  
The probation service sent Ronald to Paula.
- 8a.  
The garage borrowed Susan from Malcolm.
- 8b.  
The garage loaned Susan to Malcolm.
- 9a.  
The committee collected Julie from Robert.
- 9b.  
The committee delivered Julie to Robert.
- 10a.  
The council removed Simon from Gail.
- 10b.  
The council returned Simon to Gail.
- 11a.  
The newspaper grabbed Stuart from Fiona.
- 11b.  
The newspaper rushed Stuart to Fiona.
- 12a.  
The airline collected Angela from Joseph.
- 12b.  
The airline flew Angela to Joseph.
- 13a.  
The nightclub hired Cathy from Timothy.
- 13b.  
The nightclub rented Cathy to Timothy.
- 14a.  
The hospital accepted Henry from Sharon.
- 14b.  
The hospital sent Henry to Sharon.
- 15a.  
The college borrowed Julia from Steven.
- 15b.  
The college loaned Julia to Steven.
- 16a.  
The children's' home took Reggie from Karen.

16b.  
The children's home returned Reggie to Karen.

### ***Materials used in Experiment 14***

The versions of the sentences were as follows:  
The sentence has the Goal-Source order.  
The sentence has the Source-Goal order.

1a.  
John snatched Bill from Simon.

1b.  
John pushed Bill to Simon.

2a.  
Malcolm grabbed Stuart from William.

2b.  
Malcolm passed Stuart to William.

3a.  
Matthew borrowed Tony from Adam.

3b.  
Matthew returned Tony to Adam.

4a.  
Robert collected Duncan from Bob.

4b.  
Robert sent Duncan to Bob.

5a.  
Diane grasped Angela from Catherine.

5b.  
Diane carried Angela to Catherine.

6a.  
Barbara abducted Brenda from Alice.

6b.  
Barbara drove Brenda to Alice.

7a.  
Hilda pinched Linda from Shirley.

7b.  
Hilda chased Linda over to Shirley.

8a.  
Sharon adopted Helen from Susan.

8b.  
Sharon gave Helen to Susan.

9a.  
Vincent collected Kenneth from Brian.

9b.  
Vincent flew Kenneth to Brian.

10a.  
Derek stole Michael from Keith.

10b.  
Derek turned Michael over to Keith.

11a.  
Colin hurried Gary away from Alan.

- 11b.  
Colin hurried Gary to Alan.
- 12a.  
Jason borrowed Trevor from Thomas.
- 12b.  
Jason loaned Trevor to Thomas.
- 13a.  
Julie collected Rachel from Sandra.
- 13b.  
Julie passed Rachel to Sandra.
- 14a.  
Nicola pinched Eleanor from Karen.
- 14b.  
Nicola sent Eleanor to Karen.
- 15a.  
Sarah snatched Jenny from Mary.
- 15b.  
Sarah handed Jenny to Mary.
- 16a.  
Vicky removed Emma from Joan.
- 16b.  
Vicky delivered Emma to Joan.

### ***Materials used in Experiment 15***

The versions of the sentences were as follows:  
The sentence has the Goal-Source order.  
The sentence has the Source-Goal order.

- 1a.  
The charity acquired the money from the hospital.
- 1b.  
The charity donated the money to the hospital.
- 2a.  
The department acquired the information from the government.
- 2b.  
The department gave the information to the government.
- 3a.  
The garage rented the car from the shop.
- 3b.  
The garage loaned the car to the shop.
- 4a.  
The court seized the documents from the company.
- 4b.  
The court passed the documents to the company.
- 5a.  
The club withdrew a cheque from the building society.
- 5b.  
The club issued a cheque to the building society.
- 6a.  
The college obtained the certificate from the head-office.

- 6b.  
The college sent the certificate to the head-office.
- 7a.  
The school received an article from the newspaper.
- 7b.  
The school posted an article to the newspaper.
- 8a.  
The library collected the books from the school.
- 8b.  
The library issued the books to the school.
- 9a.  
The council confiscated the keys from the night club.
- 9b.  
The council presented the keys to the night club.
- 10a.  
The airline collected the parcel from the firm.
- 10b.  
The airline flew the parcel to the firm.
- 11a.  
The estate acquired the building from the corporation
- 11b.  
The estate loaned the building to the corporation.
- 12a.  
The supermarket borrowed the money from the bank.
- 12b.  
The supermarket deposited the money in the bank.
- 13a.  
The delivery van took the parcel from the warehouse.
- 13b.  
The delivery van dispatched the parcel to the warehouse.
- 14a.  
The head-office accepted the equipment from the supplier.
- 14b.  
The head-office returned the equipment to the supplier.
- 15a.  
The probation service received a report from the prison.
- 15b.  
The probation service returned a report to the prison.
- 16a.  
The committee received a letter from the university.
- 16b.  
The committee posted a letter to the university.

## ***Materials used in Experiments 19a and 19b***

The versions of the texts were as follows:

The first sentence is in the active voice. The second, target sentence contains a subject anaphor with a (parallel) subject antecedent and a non-subject anaphor with a (parallel) non-subject antecedent. [Experiment 19a]

The first sentence is in the active voice. The second, target sentence contains a subject anaphor with a (non-parallel) non-subject antecedent and a non-subject anaphor with a (non-parallel) subject antecedent. [Experiment 19a]

The first sentence is in the passive voice. The second, target sentence contains a subject anaphor with a (parallel) subject antecedent and a non-subject anaphor with a (parallel) non-subject antecedent. [Experiment 19b]

The first sentence is in the passive voice. The second, target sentence contains a subject anaphor with a (non-parallel) non-subject antecedent and a non-subject anaphor with a (non-parallel) subject antecedent. [Experiment 19b]

(Note: For considerations of space, the two possible modes of description for both the subject anaphor and the non-subject anaphor [pronoun or noun phrase] is shown in square brackets.)

1a.

The curtain hid the picture from view.

[It / The curtain] was pulled back in order to display [it / the picture].

Gasps of shock were heard from the crowd.

1b.

The picture hung behind the curtain.

[It / The curtain] was pulled back in order to display [it / the picture].

Gasps of shock were heard from the crowd.

1c.

The curtain was used to hide the picture from view.

[It / The curtain] was pulled back in order to display [it / the picture].

Gasps of shock were heard from the crowd.

1d.

The picture was hidden from view behind the curtain.

[It / The curtain] was pulled back in order to display [it / the picture].

Gasps of shock were heard from the crowd.

2a.

A wall totally surrounded the forest.

[It / The wall] was built in order to protect [it / the forest].

Access problems were an issue at the National Park.

2b.

A forest stood inside the wall.

[It / The wall] was built in order to protect [it / the forest].

Access problems were an issue at the National Park.

2c.

A wall had been erected around the forest.

[It / The wall] was built in order to protect [it / the forest].

Access problems were an issue at the National Park.

2d.

A forest was totally surrounded by the wall.

[It / The wall] was built in order to protect [it / the forest].

Access problems were an issue at the National Park.

3a.

The magazine had featured the engine.

[It / The magazine] recommends everyone to buy [it / the engine].

Millions had been spent on research and development.

3b.

The engine features strongly in the magazine.

[It / The magazine] recommends everyone to buy [it / the engine].

Millions had been spent on research and development.

3c.

The magazine had been chosen to feature the engine.

[It / The magazine] recommends everyone to buy [it / the engine].

Millions had been spent on research and development.

3d.  
The engine had been featured in the magazine.  
[It / The magazine] recommends everyone to buy [it / the engine].  
Millions had been spent on research and development.

4a.  
The ship waited for the coal to be loaded quickly.  
[It / The ship] sailed fairly regularly to deliver [it / the coal].  
There was a tight schedule to keep.

4b.  
The coal sat waiting on the ship.  
[It / The ship] sailed fairly regularly to deliver [it / the coal].  
There was a tight schedule to keep.

4c.  
The ship had been quickly loaded with the coal.  
[It / The ship] sailed fairly regularly to deliver [it / the coal].  
There was a tight schedule to keep.

4d.  
The coal was quickly loaded onto the ship.  
[It / The ship] sailed fairly regularly to deliver [it / the coal].  
There was a tight schedule to keep.

5a.  
The case stores the crown safely.  
[It / The case] is only opened in order to exhibit [it / the crown].  
Security is of primary importance.

5b.  
The crown sits safely locked in the case.  
[It / The case] is only opened in order to exhibit [it / the crown].  
Security is of primary importance.

5c.  
The case is used to store the crown.  
[It / The case] is only opened in order to exhibit [it / the crown].  
Security is of primary importance.

5d.  
The crown is stored in the case.  
[It / The case] is only opened in order to exhibit [it / the crown].  
Security is of primary importance.

6a.  
The lamp shone onto the diamond.  
[It / The lamp] was used to illuminate [it / the diamond] to good effect.  
Crowds were flocking to the exhibition.

6b.  
The diamond sparkled under the lamp.  
[It / The lamp] was used to illuminate [it / the diamond] to good effect.  
Crowds were flocking to the exhibition.

6c.  
The lamp was positioned over the diamond.  
[It / The lamp] was used to illuminate [it / the diamond] to good effect.  
Crowds were flocking to the exhibition.

6d.  
The diamond was positioned under the lamp.  
[It / The lamp] was used to illuminate [it / the diamond] to good effect.  
Crowds were flocking to the exhibition.

7a.  
The plane had just developed a faulty motor.  
[It / The plane] wouldn't fly unless [it / the motor] was replaced.  
Repairs would take about a week.

7b.  
The motor had blown on the plane.  
[It / The plane] wouldn't fly unless [it / the motor] was replaced.  
Repairs would take about a week.

7c.

The plane was brought in with a faulty motor.

[It / The plane] wouldn't fly unless [it / the motor] was replaced.

Repairs would take about a week.

7d.

The motor was removed from the plane.

[It / The plane] wouldn't fly unless [it / the motor] was replaced.

Repairs would take about a week.

8a.

The journal had recently featured the record.

[It / The journal] had been bribed to review [it / the record] favourably.

A good review usually ensures a high chart position.

8b.

The record recently featured in the journal.

[It / The journal] had been bribed to review [it / the record] favourably.

A good review usually ensures a high chart position.

8c.

The journal was paid to feature the record.

[It / The journal] had been bribed to review [it / the record] favourably.

A good review usually ensures a high chart position.

8d.

The record was recently featured in the journal.

[It / The journal] had been bribed to review [it / the record] favourably.

A good review usually ensures a high chart position.

9a.

The book describes the car very well.

[It / The book] carefully explains [it / the car] in great detail.

Such a complete explanation is important.

9b.

The car takes up most of the book.

[It / The book] carefully explains [it / the car] in great detail.

Such a complete explanation is important.

9c.

The book was written to describe the car.

[It / The book] carefully explains [it / the car] in great detail.

Such a complete explanation is important.

9d.

The car is described in the book.

[It / The book] carefully explains [it / the car] in great detail.

Such a complete explanation is important.

10a.

The plant flourished near to the fence.

[It / The plant] now grew slightly above [it / the fence].

Usually, ferns are only a couple of feet high.

10b.

The fence provided some support for the plant.

[It / The plant] now grew slightly above [it / the fence].

Usually, ferns are only a couple of feet high.

10c.

The plant was supported by the fence.

[It / The plant] now grew slightly above [it / the fence].

Usually, ferns are only a couple of feet high.

10d.

The fence had become almost hidden by the plant.

[It / The plant] now grew slightly above [it / the fence].

Usually, ferns are only a couple of feet high.

11a.

The rope hoisted the flag.

[It / The rope] securely tied [it / the flag] in place.

There was a fair amount of wind today.



11b.

The flag swung from the rope.  
[It / The rope] securely tied [it / the flag] in place.  
There was a fair amount of wind today.

11c.

The rope was needed to hoist the flag.  
[It / The rope] securely tied [it / the flag] in place.  
There was a fair amount of wind today.

11d.

The flag was hoisted on the rope.  
[It / The rope] securely tied [it / the flag] in place.  
There was a fair amount of wind today.

12a.

The gate only closes if the chain is used.  
[It / The gate] swings wide open without [it / the chain] fastened  
There was a fair amount of wind today.

12b.

The chain locks to keep the gate closed.  
[It / The gate] swings wide open without [it / the chain] fastened  
There was a fair amount of wind today.

12c.

The gate is locked with the chain.  
[It / The gate] swings wide open without [it / the chain] fastened  
There was a fair amount of wind today.

12d.

The chain must be locked to keep the gate closed.  
[It / The gate] swings wide open without [it / the chain] fastened  
There was a fair amount of wind today.

13a.

The string stopped the wheel rotating.  
[It / The string] was knotted quite tightly around [it / the wheel].  
There was no give in the knot.

13b.

The wheel couldn't move with the string fastened.  
[It / The string] was knotted quite tightly around [it / the wheel].  
There was no give in the knot.

13c.

The string had been fastened to stop the wheel rotating.  
[It / The string] was knotted quite tightly around [it / the wheel].  
There was no give in the knot.

13d.

The wheel was held still with the string.  
[It / The string] was knotted quite tightly around [it / the wheel].  
There was no give in the knot.

14a.

The ball flew towards the window.  
[It / The ball] fell against [it / the window] with some force.  
That was the third time it had happened.

14b.

The window shuddered as the ball collided.  
[It / The ball] fell against [it / the window] with some force.  
That was the third time it had happened.

14c.

The ball was thrown towards the window.  
[It / The ball] fell against [it / the window] with some force.  
That was the third time it had happened.

14d.

The window was smashed by the ball.  
[It / The ball] fell against [it / the window] with some force.  
That was the third time it had happened.

15a.  
The pole slots tightly into the hole.  
[It / The pole] can only slot into [it / the hole] one way.  
A tight fit was absolutely necessary.

15b.  
The hole securely holds the pole upright.  
[It / The pole] can only slot into [it / the hole] one way.  
A tight fit was absolutely necessary.

15c.  
The pole is slotted tightly into the hole.  
[It / The pole] can only slot into [it / the hole] one way.  
A tight fit was absolutely necessary.

15d.  
The hole was cut to fit the pole.  
[It / The pole] can only slot into [it / the hole] one way.  
A tight fit was absolutely necessary.

16a.  
The tent stood dangerously near to the river.  
[It / The tent] had been pitched far too close to [it / the river].  
Heavy downpours had been forecast.

16b.  
The river threatened to waterlog the tent.  
[It / The tent] had been pitched far too close to [it / the river].  
Heavy downpours had been forecast.

16c.  
The tent could be swept away by the river.  
[It / The tent] had been pitched far too close to [it / the river].  
Heavy downpours had been forecast.

16d.  
The river was channelled toward the tent.  
[It / The tent] had been pitched far too close to [it / the river].  
Heavy downpours had been forecast.

## ***Materials used in Experiments 20a and 20b***

The versions of the texts were as follows:

Both sentences are in the active voice. The second, target sentence contains a subject anaphor with a (parallel) subject antecedent and a non-subject anaphor with a (parallel) non-subject antecedent. [Experiment 20a]

Both sentences are in the active voice. The second, target sentence contains a subject anaphor with a (non-parallel) non-subject antecedent and a non-subject anaphor with a (non-parallel) subject antecedent. [Experiment 20a]

Both sentences are in the passive voice. The second, target sentence contains a subject anaphor with a (parallel) subject antecedent and a non-subject anaphor with a (parallel) non-subject antecedent. [Experiment 20b]

Both sentences are in the passive voice. The second, target sentence contains a subject anaphor with a (non-parallel) non-subject antecedent and a non-subject anaphor with a (non-parallel) subject antecedent. [Experiment 20b]

(Note: For considerations of space, the two possible modes of description for both the subject anaphor and the non-subject anaphor [pronoun or noun phrase] is shown in square brackets.)

1a.  
The lighthouse shone out towards the steamboat.  
[It / The lighthouse] steadfastly warned [it / the steamboat] away from danger.

1b.  
The steamboat drifted towards the lighthouse.  
[It / The lighthouse] steadfastly warned [it / the steamboat] away from danger.

1c.  
The steamboat was suddenly swept towards the lighthouse.  
[It / The steamboat] was blown dangerously close to [it / the lighthouse].

1d.  
The lighthouse was quickly directed out to the steamboat.  
[It / The steamboat] was blown dangerously close to [it / the lighthouse].

- 2a.  
The guitar should plug into the amplifier.  
[It / The guitar] can't play very loudly without [it / the amplifier].
- 2b.  
The amplifier should plug into the guitar.  
[It / The guitar] can't play very loudly without [it / the amplifier].
- 2c.  
The guitar must be plugged into the amplifier.  
[It / The guitar] can't be played loudly without [it / the amplifier].
- 2d.  
The amplifier must be connected up to the guitar.  
[It / The guitar] can't be played loudly without [it / the amplifier].
- 3a.  
The rifle pointed straight towards the target.  
[It / The rifle] had hit [it / the target] ten times already.
- 3b.  
The target was only 20 meters from the rifle.  
[It / The rifle] had hit [it / the target] ten times already.
- 3c.  
The rifle was moved even nearer to the target.  
[It / The rifle] was easily aimed at [it / the target] now.
- 3d.  
The target was positioned closer to the rifle.  
[It / The rifle] was easily aimed at [it / the target] now.
- 4a.  
The booklet advises about the medicine.  
[It / The booklet] states how much of [it / the medicine] to take.
- 4b.  
The medicine also comes with a booklet.  
[It / The booklet] states how much of [it / the medicine] to take.
- 4c.  
The booklet is sent with the medicine.  
[It / The booklet] should be read before [it / the medicine] is taken.
- 4d.  
The medicine is explained in the booklet.  
[It / The booklet] should be read before [it / the medicine] is taken.
- 5a.  
The submarine detected an approaching torpedo.  
[It / The submarine] very quickly steered away from [it / the torpedo].
- 5b.  
A torpedo headed straight for the submarine.  
[It / The submarine] very quickly steered away from [it / the torpedo].
- 5c.  
The submarine was about to be hit by a torpedo.  
[It / The submarine] was quickly steered away from [it / the torpedo].
- 5d.  
A torpedo was aimed directly at the submarine.  
[It / The submarine] was quickly steered away from [it / the torpedo].
- 6a.  
The river was rising towards the tent.  
[It / The river] would wash [it / the tent] away if rain continued.
- 6b.  
The tent stood dangerously close to the river.  
[It / The river] would wash [it / the tent] away if rain continued.
- 6c.  
The tent might be swept away by the river.  
[It / The tent] was pitched far too close to [it / the river].

- 6d.  
The river had been channelled towards the tent.  
[It / The tent] was pitched far too close to [it / the river].
- 7a.  
The ocean was rapidly eroding the beach.  
[It / The ocean] would soon wash most of [it / the beach] away.
- 7b.  
The beach had sunk further into the ocean.  
[It / The ocean] would soon wash most of [it / the beach] away.
- 7c.  
The beach was being swept into the ocean.  
[It / The beach] would soon be completely submerged by [it / the ocean].
- 7d.  
The ocean was whipped up across the beach.  
[It / The beach] would soon be completely submerged by [it / the ocean].
- 8a.  
The guidebook fully describes the cathedral.  
[It / The guidebook] carefully explains [it / the cathedral] in some detail.
- 8b.  
The cathedral takes up much of the guidebook.  
[It / The guidebook] carefully explains [it / the cathedral] in some detail.
- 8c.  
The guidebook was produced for the cathedral.  
[It / The guidebook] had been written exclusively for [it / the cathedral].
- 8d.  
The cathedral is fully described in the guidebook.  
[It / The guidebook] had been written exclusively for [it / the cathedral].
- 9a.  
The moat totally surrounded the outpost.  
[It / The moat] effectively protected [it / the outpost] from any invasion.
- 9b.  
The outpost stood inside the moat.  
[It / The moat] effectively protected [it / the outpost] from any invasion.
- 9c.  
A moat was built encircling the outpost.  
[It / The moat] was put around [it / the outpost] for protection.
- 9d.  
The outpost is encircled by a moat.  
[It / The moat] was put around [it / the outpost] for protection.
- 10a.  
The safe usually stores the crown.  
[It / The safe] is an extremely secure place for [it / the crown].
- 10b.  
The crown usually stays in the safe.  
[It / The safe] is an extremely secure place for [it / the crown].
- 10c.  
The crown is normally locked in the safe.  
[It / The crown] is only removed from [it / the safe] at exhibitions.
- 10d.  
The safe is always used for the crown.  
[It / The crown] is only removed from [it / the safe] at exhibitions.
- 11a.  
The magazine has recently featured the engine.  
[It / The magazine] does give [it / the engine] a very good review.
- 11b.  
The engine has recently featured in the magazine.  
[It / The magazine] does give [it / the engine] a very good review.

11c.

The engine was recently featured in the magazine.

[It / The engine] was given a good review in [it / the magazine].

11d.

The magazine was used to feature the engine.

[It / The engine] was given a good review in [it / the magazine].

12a.

The dockyard was to service the battleship.

[It / The dockyard] would repair [it / the battleship] within the month.

12b.

The battleship headed back to the dockyard.

[It / The dockyard] would repair [it / the battleship] within the month.

12c.

The battleship was returned to the dockyard.

[It / The battleship] was steered into [it / the dockyard] very carefully.

12d.

The dockyard was used for the battleship.

[It / The battleship] was steered into [it / the dockyard] very carefully.

13a.

The padlock securely locks the chest.

[It / The padlock] safely holds [it / the chest] tightly closed.

13b.

The chest locks securely with the padlock.

[It / The padlock] safely holds [it / the chest] tightly closed.

13c.

The padlock is always put onto the chest.

[It / The padlock] is rarely taken off [it / the chest].

13d.

The chest is always locked with the padlock.

[It / The padlock] is rarely taken off [it / the chest].

14a.

The cable had stabilised the canopy.

[It / The cable] should prevent [it / the canopy] from blowing over.

14b.

The canopy used the cable for support.

[It / The cable] should prevent [it / the canopy] from blowing over.

14c.

The canopy was held down with the cable.

[It / The canopy] really needed [it / the cable] there when windy.

14d.

The cable was tightly fastened to the canopy.

[It / The canopy] really needed [it / the cable] there when windy.

15a.

The train is very late getting the coal.

[It / The train] really must deliver [it / the coal] before the morning.

15b.

The coal should've been on the train by now.

[It / The train] really must deliver [it / the coal] before the morning.

15c.

The coal was hurriedly loaded onto the train.

[It / The coal] should have been put on [it / the train] yesterday.

15d.

The train was hurriedly loaded with the coal.

[It / The coal] should have been put on [it / the train] yesterday.

16a.

The fire had entirely destroyed the church.

[It / The fire] totally engulfed [it / the church] in minutes.

16b.  
The church burned in the fire.  
[It / The fire] totally engulfed [it / the church] in minutes.

16c.  
The church was severely damaged in the fire.  
[It / The church] was totally engulfed by [it / the fire].

16d.  
The fire was probably started in the church.  
[It / The church] was totally engulfed by [it / the fire].

## ***Materials used in Experiments 21a and 21b***

The versions of the texts were as follows:

The first and second sentences are in the active voice. The second, target sentence contains a subject anaphor with a (parallel) subject antecedent and a non-subject anaphor with a (parallel) non-subject antecedent. [Experiment 21a]

The first and second sentences are in the active voice. The second, target sentence contains a subject anaphor with a (non-parallel) non-subject antecedent and a non-subject anaphor with a (non-parallel) subject antecedent. [Experiment 21a]

The first and second sentences are in the passive voice. The second, target sentence contains a subject anaphor with a (parallel) subject antecedent and a non-subject anaphor with a (parallel) non-subject antecedent. [Experiment 21b]

The first and second sentences are in the passive voice. The second, target sentence contains a subject anaphor with a (non-parallel) non-subject antecedent and a non-subject anaphor with a (non-parallel) subject antecedent. [Experiment 21b]

(Note: For considerations of space, the two possible modes of description for both the subject anaphor and the non-subject anaphor [pronoun or noun phrase] is shown in square brackets.)

1a.  
The lighthouse shone out towards the steamboat.  
[It / The lighthouse] steadfastly warned [it / the steamboat] away from danger.  
This area was especially treacherous.

1b.  
The steamboat drifted towards the lighthouse.  
[It / The lighthouse] steadfastly warned [it / the steamboat] away from danger.  
This area was especially treacherous.

1c.  
The steamboat was suddenly swept towards the lighthouse.  
[It / The steamboat] was blown dangerously close to [it / the lighthouse].  
This area was especially treacherous.

1d.  
The lighthouse was quickly directed out to the steamboat.  
[It / The steamboat] was blown dangerously close to [it / the lighthouse].  
This area was especially treacherous.

2a.  
The guitar should plug into the amplifier.  
[It / The guitar] can't play very loudly without [it / the amplifier].  
People near the back couldn't really hear.

2b.  
The amplifier should plug into the guitar.  
[It / The guitar] can't play very loudly without [it / the amplifier].  
People near the back couldn't really hear.

2c.  
The guitar must be plugged into the amplifier.  
[It / The guitar] can't be played loudly without [it / the amplifier].  
People near the back couldn't really hear.

2d.  
The amplifier must be connected up to the guitar.  
[It / The guitar] can't be played loudly without [it / the amplifier].  
People near the back couldn't really hear.

3a.  
The rifle pointed straight towards the target.  
[It / The rifle] had hit [it / the target] ten times already.  
Another bull's-eye was needed to win.

3b.

The target was only 20 meters from the rifle.  
[It / The rifle] had hit [it / the target] ten times already.  
Another bull's-eye was needed to win.

3c.

The rifle was moved even nearer to the target.  
[It / The rifle] was easily aimed at [it / the target] now.  
Another bull's-eye was needed to win.

3d.

The target was positioned closer to the rifle.  
[It / The rifle] was easily aimed at [it / the target] now.  
Another bull's-eye was needed to win.

4a.

The booklet advises about the medicine.  
[It / The booklet] states how much of [it / the medicine] to take.  
Overdoses could be fatal.

4b.

The medicine also comes with a booklet.  
[It / The booklet] states how much of [it / the medicine] to take.  
Overdoses could be fatal.

4c.

The booklet is sent with the medicine.  
[It / The booklet] should be read before [it / the medicine] is taken.  
Overdoses could be fatal.

4d.

The medicine is explained in the booklet.  
[It / The booklet] should be read before [it / the medicine] is taken.  
Overdoses could be fatal.

5a.

The submarine detected an approaching torpedo.  
[It / The submarine] very quickly steered away from [it / the torpedo].  
This was a dangerous stretch of water.

5b.

A torpedo headed straight for the submarine.  
[It / The submarine] very quickly steered away from [it / the torpedo].  
This was a dangerous stretch of water.

5c.

The submarine was about to be hit by a torpedo.  
[It / The submarine] was quickly steered away from [it / the torpedo].  
This was a dangerous stretch of water.

5d.

A torpedo was aimed directly at the submarine.  
[It / The submarine] was quickly steered away from [it / the torpedo].  
This was a dangerous stretch of water.

6a.

The river was rising towards the tent.  
[It / The river] would wash [it / the tent] away if rain continued.  
Further heavy downpours were expected later.

6b.

The tent stood dangerously close to the river.  
[It / The river] would wash [it / the tent] away if rain continued.  
Further heavy downpours were expected later.

6c.

The tent might be swept away by the river.  
[It / The tent] was pitched far too close to [it / the river].  
Further heavy downpours were expected later.

6d.

The river had been channelled towards the tent.  
[It / The tent] was pitched far too close to [it / the river].  
Further heavy downpours were expected later.

- 7a.  
The ocean was rapidly eroding the beach.  
[It / The ocean] would soon wash most of [it / the beach] away.  
Tropical storms made matters worse.
- 7b.  
The beach had sunk further into the ocean.  
[It / The ocean] would soon wash most of [it / the beach] away.  
Tropical storms made matters worse.
- 7c.  
The beach was being swept into the ocean.  
[It / The beach] would soon be completely submerged by [it / the ocean].  
Tropical storms made matters worse.
- 7d.  
The ocean was whipped up across the beach.  
[It / The beach] would soon be completely submerged by [it / the ocean].  
Tropical storms made matters worse.
- 8a.  
The guidebook fully describes the cathedral.  
[It / The guidebook] carefully explains [it / the cathedral] in some detail.  
Visitors were now flocking to the area.
- 8b.  
The cathedral takes up much of the guidebook.  
[It / The guidebook] carefully explains [it / the cathedral] in some detail.  
Visitors were now flocking to the area.
- 8c.  
The guidebook was produced for the cathedral.  
[It / The guidebook] had been written exclusively for [it / the cathedral].  
Visitors were now flocking to the area.
- 8d.  
The cathedral is fully described in the guidebook.  
[It / The guidebook] had been written exclusively for [it / the cathedral].  
Visitors were now flocking to the area.
- 9a.  
The moat totally surrounded the outpost.  
[It / The moat] effectively protected [it / the outpost] from any invasion.  
Marauding gangs had been seen nearby.
- 9b.  
The outpost stood inside the moat.  
[It / The moat] effectively protected [it / the outpost] from any invasion.  
Marauding gangs had been seen nearby.
- 9c.  
A moat was built encircling the outpost.  
[It / The moat] was put around [it / the outpost] for protection.  
Marauding gangs had been seen nearby.
- 9d.  
The outpost is encircled by a moat.  
[It / The moat] was put around [it / the outpost] for protection.  
Marauding gangs had been seen nearby.
- 10a.  
The safe usually stores the crown.  
[It / The safe] is an extremely secure place for [it / the crown].  
Security is of utmost importance.
- 10b.  
The crown usually stays in the safe.  
[It / The safe] is an extremely secure place for [it / the crown].  
Security is of utmost importance.
- 10c.  
The crown is normally locked in the safe.  
[It / The crown] is only removed from [it / the safe] at exhibitions.  
Security is of utmost importance.



10d.  
The safe is always used for the crown.  
[It / The crown] is only removed from [it / the safe] at exhibitions.  
Security is of utmost importance.

11a.  
The magazine has recently featured the engine.  
[It / The magazine] does give [it / the engine] a very good review.  
Good write-ups ensure higher sales.

11b.  
The engine has recently featured in the magazine.  
[It / The magazine] does give [it / the engine] a very good review.  
Good write-ups ensure higher sales.

11c.  
The engine was recently featured in the magazine.  
[It / The engine] was given a good review in [it / the magazine].  
Good write-ups ensure higher sales.

11d.  
The magazine was used to feature the engine.  
[It / The engine] was given a good review in [it / the magazine].  
Good write-ups ensure higher sales.

12a.  
The dockyard was to service the battleship.  
[It / The dockyard] would repair [it / the battleship] within the month.  
Repairs were to be carried out immediately.

12b.  
The battleship headed back to the dockyard.  
[It / The dockyard] would repair [it / the battleship] within the month.  
Repairs were to be carried out immediately.

12c.  
The battleship was returned to the dockyard.  
[It / The battleship] was steered into [it / the dockyard] very carefully.  
Repairs were to be carried out immediately.

12d.  
The dockyard was used for the battleship.  
[It / The battleship] was steered into [it / the dockyard] very carefully.  
Repairs were to be carried out immediately.

13a.  
The padlock securely locks the chest.  
[It / The padlock] safely holds [it / the chest] tightly closed.  
These precautions are absolutely necessary.

13b.  
The chest locks securely with the padlock.  
[It / The padlock] safely holds [it / the chest] tightly closed.  
These precautions are absolutely necessary.

13c.  
The padlock is always put onto the chest.  
[It / The padlock] is rarely taken off [it / the chest].  
These precautions are absolutely necessary.

13d.  
The chest is always locked with the padlock.  
[It / The padlock] is rarely taken off [it / the chest].  
These precautions are absolutely necessary.

14a.  
The cable had stabilised the canopy.  
[It / The cable] should prevent [it / the canopy] from blowing over.  
Gales had been forecast for later.

14b.  
The canopy used the cable for support.  
[It / The cable] should prevent [it / the canopy] from blowing over.  
Gales had been forecast for later.

14c.

The canopy was held down with the cable.

[It / The canopy] really needed [it / the cable] there when windy.

Gales had been forecast for later.

14d.

The cable was tightly fastened to the canopy.

[It / The canopy] really needed [it / the cable] there when windy.

Gales had been forecast for later.

15a.

The train is very late getting the coal.

[It / The train] really must deliver [it / the coal] before the morning.

There was a tight schedule to keep.

15b.

The coal should've been on the train by now.

[It / The train] really must deliver [it / the coal] before the morning.

There was a tight schedule to keep.

15c.

The coal was hurriedly loaded onto the train.

[It / The coal] should have been put on [it / the train] yesterday.

There was a tight schedule to keep.

15d.

The train was hurriedly loaded with the coal.

[It / The coal] should have been put on [it / the train] yesterday.

There was a tight schedule to keep.

16a.

The fire had entirely destroyed the church.

[It / The fire] totally engulfed [it / the church] in minutes.

Nearby streets were also affected.

16b.

The church burned in the fire.

[It / The fire] totally engulfed [it / the church] in minutes.

Nearby streets were also affected.

16c.

The church was severely damaged in the fire.

[It / The church] was totally engulfed by [it / the fire].

Nearby streets were also affected.

16d.

The fire was probably started in the church.

[It / The church] was totally engulfed by [it / the fire].

Nearby streets were also affected.

**APPENDIX B: STATISTICAL TABLES**

**Table 21: Summary for the ANOVAs in Experiment 1 across participants**

Source	SS	df	MS	F	Sig.
ROLE	330.785	1	330.785	50.586	.000
error	411.965	63	6.539		
NAME	.660	1	.660	.472	.495
error	88.090	63	1.398		
ROLE*NAME	5.941	1	5.941	3.348	.072
error	111.809	63	1.775		

**Table 22: Summary for the ANOVAs in Experiment 1 across items**

Source	SS	df	MS	F	Sig.
NAME	1.320	1	1.320	.370	.545
ROLE*NAME	11.883	1	11.883	3.329	.073
error	221.297	63	3.569		

Source	SS	df	MS	F	Sig.
Intercept	12980.633	1	12980.633	1506.277	.000
ROLE	661.570	1	661.570	76.769	.000
error	534.297	63	8.618		

**Table 23: Summary for the ANOVAs in Experiment 2 across participants**

Source	SS	df	MS	F	Sig.
ROLE	96.258	1	96.258	23.620	.000
error	256.742	63	4.075		
NAME	3.906E-02	1	3.906E-02	.052	.820
error	47.261	63	.750		
ROLE*NAME	3.906E-02	1	3.906E-02	.048	.827
error	50.961	63	.809		

**Table 24: Summary for the ANOVAs in Experiment 2 across items**

Source	SS	df	MS	F	Sig.
NAME	3.403	1	3.403	1.876	.176
ROLE*NAME	2.628	1	2.628	1.449	.233
error	112.469	62	1.814		

Source	SS	df	MS	F	Sig.
Intercept	5833.141	1	5833.141	1381.185	.000
ROLE	192.516	1	192.516	45.584	.000
error	261.844	62	4.223		

**Table 25: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across participants**

		N	Mean Rank	Sum of Ranks	
NN2 – NN1	Negative Ranks	12 <sup>a</sup>	14.33	172.00	a. NN2 < NN1
	Positive Ranks	14 <sup>b</sup>	12.79	179.00	b. NN2 > NN1
	Ties	6 <sup>c</sup>			c. NN1 = NN2
	Totals	32			d. DD2 < DD1
DD2 – DD1	Negative Ranks	22 <sup>d</sup>	14.36	316.00	e. DD2 > DD1
	Positive Ranks	5 <sup>c</sup>	12.40	62.00	f. DD1 = DD2
	Ties	5 <sup>f</sup>			g. ND2 < ND1
	Totals	32			h. ND2 > ND1
ND2 – ND1	Negative Ranks	21 <sup>e</sup>	14.21	298.50	i. ND1 = ND2
	Positive Ranks	4 <sup>h</sup>	6.63	26.50	j. DN2 < DN1
	Ties	7 <sup>i</sup>			k. DN2 > DN1
	Totals	32			l. DN1 = DN2
DN2 – DN1	Negative Ranks	6 <sup>j</sup>	7.50	45.00	
	Positive Ranks	23 <sup>k</sup>	16.96	390.00	
	Ties	3 <sup>l</sup>			
	Totals	32			

	NN2 – NN1	DD2 – DD1	ND2 – ND1	DN2 – DN1	
Z	-.089 <sup>a</sup>	-3.073 <sup>b</sup>	-3.677 <sup>b</sup>	-3.747 <sup>a</sup>	a. Based on negative ranks
Asymp. Sig. (2-tailed)	.929	.002	.000	.000	b. Based on positive ranks

**Table 26: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across items**

		N	Mean Rank	Sum of Ranks	
NN2 – NN1	Negative Ranks	14 <sup>a</sup>	16.43	230.00	a. NN2 < NN1
	Positive Ranks	17 <sup>b</sup>	15.65	266.00	b. NN2 > NN1
	Ties	1 <sup>c</sup>			c. NN1 = NN2
	Totals	32			d. DD2 < DD1
DD2 – DD1	Negative Ranks	20 <sup>d</sup>	18.40	368.00	e. DD2 > DD1
	Positive Ranks	11 <sup>c</sup>	11.64	128.00	f. DD1 = DD2
	Ties	1 <sup>f</sup>			g. ND2 < ND1
	Totals	32			h. ND2 > ND1
ND2 – ND1	Negative Ranks	26 <sup>g</sup>	17.13	445.50	i. ND1 = ND2
	Positive Ranks	5 <sup>h</sup>	10.10	50.50	j. DN2 < DN1
	Ties	1 <sup>f</sup>			k. DN2 > DN1
	Totals	32			l. DN1 = DN2
DN2 – DN1	Negative Ranks	7 <sup>i</sup>	10.50	73.50	
	Positive Ranks	25 <sup>k</sup>	18.18	454.50	
	Ties	0 <sup>l</sup>			
	Totals	32			

	NN2 – NN1	DD2 – DD1	ND2 – ND1	DN2 – DN1	
Z	-.355 <sup>a</sup>	-2.362 <sup>b</sup>	-3.889 <sup>b</sup>	-3.585 <sup>a</sup>	a. Based on negative ranks
Asymp. Sig. (2-tailed)	.723	.018	.000	.000	b. Based on positive ranks

**Table 27: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across items with the main-main structure**

		N	Mean Rank	Sum of Ranks	
NN2 – NN1	Negative Ranks	7 <sup>a</sup>	10.50	73.50	a. NN2 < NN1
	Positive Ranks	10 <sup>b</sup>	7.95	79.50	b. NN2 > NN1
	Ties	0 <sup>c</sup>			c. NN1 = NN2
	Totals	17			d. DD2 < DD1
DD2 – DD1	Negative Ranks	11 <sup>d</sup>	9.73	107.00	e. DD2 > DD1
	Positive Ranks	6 <sup>c</sup>	7.67	46.00	f. DD1 = DD2
	Ties	0 <sup>f</sup>			g. ND2 < ND1
	Totals	17			h. ND2 > ND1
ND2 – ND1	Negative Ranks	13 <sup>g</sup>	9.04	117.50	i. ND1 = ND2
	Positive Ranks	3 <sup>b</sup>	6.17	18.50	j. DN2 < DN1
	Ties	1 <sup>i</sup>			k. DN2 > DN1
	Totals	17			l. DN1 = DN2
DN2 – DN1	Negative Ranks	2 <sup>j</sup>	6.50	13.00	
	Positive Ranks	15 <sup>k</sup>	9.33	140.00	
	Ties	0 <sup>l</sup>			
	Totals	17			

	NN2 – NN1	DD2 – DD1	ND2 – ND1	DN2 – DN1	
Z	-.143 <sup>a</sup>	-1.452 <sup>b</sup>	-2.568 <sup>b</sup>	-3.030 <sup>a</sup>	a. Based on negative ranks
Asymp. Sig. (2-tailed)	.886	.147	.010	.002	b. Based on positive ranks

**Table 28: Summary for the Wilcoxon's rank-sum tests in Experiment 3 across items with the main-subordinate structure**

		N	Mean Rank	Sum of Ranks	
NN2 – NN1	Negative Ranks	7 <sup>a</sup>	6.71	47.00	a. NN2 < NN1
	Positive Ranks	7 <sup>b</sup>	8.29	58.00	b. NN2 > NN1
	Ties	1 <sup>c</sup>			c. NN1 = NN2
	Totals	15			d. DD2 < DD1
DD2 – DD1	Negative Ranks	9 <sup>d</sup>	9.17	82.50	e. DD2 > DD1
	Positive Ranks	5 <sup>e</sup>	4.50	22.50	f. DD1 = DD2
	Ties	1 <sup>f</sup>			g. ND2 < ND1
	Totals	15			h. ND2 > ND1
ND2 – ND1	Negative Ranks	13 <sup>g</sup>	8.69	113.00	i. ND1 = ND2
	Positive Ranks	2 <sup>h</sup>	3.50	7.00	j. DN2 < DN1
	Ties	0 <sup>i</sup>			k. DN2 > DN1
	Totals	15			l. DN1 = DN2
DN2 – DN1	Negative Ranks	5 <sup>j</sup>	5.40	27.00	
	Positive Ranks	10 <sup>k</sup>	9.30	93.00	
	Ties	0 <sup>l</sup>			
	Totals	15			

	NN2 – NN1	DD2 – DD1	ND2 – ND1	DN2 – DN1	
Z	-.348 <sup>a</sup>	-1.890 <sup>b</sup>	-3.041 <sup>b</sup>	-1.891 <sup>a</sup>	a. Based on negative ranks
Asymp. Sig. (2-tailed)	.728	.059	.002	.059	b. Based on positive ranks

**Table 29: Summary for the ANOVAs in Experiment 4 across participants**

Source	SS	df	MS	F	Sig.
CLAUSE	1239648.760	1	1239648.760	14.828	.000
error	3929419.740	47	83604.675		

**Table 30: Summary for the ANOVAs in Experiment 4 across items**

Source	SS	df	MS	F	Sig.
CLAUSE	600250.000	1	600250.000	20.116	.000
error	566936.750	19	29838.776		

**Table 31: Summary for the ANOVAs in Experiment 5 across participants**

Source	SS	df	MS	F	Sig.
CLAUSE	1594064.066	1	1594064.066	7.061	.012
error	6998619.559	31	225761.921		

**Table 32: Summary for the ANOVAs in Experiment 5 across items**

Source	SS	df	MS	F	Sig.
CLAUSE	894159.506	1	894159.506	20.271	.000
error	838106.119	19	44110.848		

**Table 33: Summary for the ANOVAs in Experiment 6 across participants**

Source	SS	df	MS	F	Sig.
ROLE	19577.258	1	19577.258	.137	.713
error	4414437.867	31	142401.222		
ANTECEDENT	14684.695	1	14684.695	.111	.741
error	4095712.430	31	132119.756		
ROLE*ANTECEDENT	7110.281	1	7110.281	.083	.775
error	2659477.344	31	85789.592		

**Table 34: Summary for the ANOVAs in Experiment 6 across items**

Source	SS	df	MS	F	Sig.
ROLE	47771.065	1	47771.065	.470	.500
error	2336174.872	23	101572.821		
ANTE	19111.148	1	19111.148	.401	.533
error	1096969.539	23	47694.328		
ROLE*ANTE	8749.711	1	8749.711	.077	.784
error	2611355.727	23	113537.206		

Table 35: Summary for the Wilcoxon's rank-sum tests in Experiment 7 across participants						
		N	Mean Rank	Sum of Ranks		
SE.S.2 – SE.S.1	Negative Ranks	0 <sup>a</sup>	.00	.00	a. SE.S.2 < SE.S.1	
	Positive Ranks	13 <sup>b</sup>	7.00	91.00	b. SE.S.2 > SE.S.1	
	Ties	3 <sup>c</sup>			c. SE.S.1 = SE.S.2	
	Totals	16			d. SE.O.2 < SE.O.1	
SE.O.2 – SE.O.1	Negative Ranks	3 <sup>d</sup>	3.33	10.00	e. SE.O.2 > SE.O.1	
	Positive Ranks	10 <sup>e</sup>	9.00	81.00	f. SE.O.1 = SE.O.2	
	Ties	3 <sup>f</sup>			g. ES.S.2 < ES.S.1	
	Totals	16			h. ES.S.2 > ES.S.1	
ES.S.2 – ES.S.1	Negative Ranks	10 <sup>g</sup>	6.40	64.00	i. ES.S.1 = ES.S.2	
	Positive Ranks	3 <sup>h</sup>	9.00	27.00	j. ES.O.2 < ES.O.1	
	Ties	3 <sup>i</sup>			k. ES.O.2 > ES.O.1	
	Totals	16			l. ES.O.1 = ES.O.2	
ES.O.2 – ES.O.1	Negative Ranks	10 <sup>j</sup>	7.15	71.50	m. NO.S.2 < NO.S.1	
	Positive Ranks	2 <sup>k</sup>	3.25	6.50	n. NO.S.2 > NO.S.1	
	Ties	4 <sup>l</sup>			o. NO.S.1 = NO.S.2	
	Totals	16			p. NO.O.2 < NO.O.1	
NO.S.2 – NO.S.1	Negative Ranks	3 <sup>m</sup>	5.67	17.00	q. NO.O.2 > NO.O.1	
	Positive Ranks	8 <sup>n</sup>	6.13	49.00	r. NO.O.1 = NO.O.2	
	Ties	5 <sup>o</sup>				
	Totals	16				
NO.O.2 – NO.O.1	Negative Ranks	5 <sup>p</sup>	6.20	31.00		
	Positive Ranks	8 <sup>q</sup>	7.50	60.00		
	Ties	3 <sup>r</sup>				
	Totals	16				
	SE.S.2 – SE.S.1	SE.O.2 – SE.O.1	ES.S.2 – ES.S.1	ES.O.2 – ES.O.1	ES.O.2 – ES.O.1	ES.O.2 – ES.O.1
Z	-3.244 <sup>a</sup>	-2.578 <sup>a</sup>	-1.347 <sup>b</sup>	-2.637 <sup>b</sup>	-1.444 <sup>a</sup>	-1.020 <sup>a</sup>
Asymp. Sig. (2-tailed)	.001	.010	.178	.008	.149	.308

a. Based on negative ranks  
b. Based on positive ranks

Table 36: Summary for the Wilcoxon's rank-sum tests in Experiment 7 across items						
		N	Mean Rank	Sum of Ranks		
SE.S.2 – SE.S.1	Negative Ranks	1 <sup>a</sup>	4.00	4.00	a. SE.S.2 < SE.S.1	
	Positive Ranks	7 <sup>b</sup>	4.57	32.00	b. SE.S.2 > SE.S.1	
	Ties	0 <sup>c</sup>			c. SE.S.1 = SE.S.2	
	Totals	8			d. SE.O.2 < SE.O.1	
SE.O.2 – SE.O.1	Negative Ranks	0 <sup>d</sup>	.00	.00	e. SE.O.2 > SE.O.1	
	Positive Ranks	6 <sup>e</sup>	3.50	21.00	f. SE.O.1 = SE.O.2	
	Ties	2 <sup>f</sup>			g. ES.S.2 < ES.S.1	
	Totals	8			h. ES.S.2 > ES.S.1	
ES.S.2 – ES.S.1	Negative Ranks	6 <sup>g</sup>	3.50	21.00	i. ES.S.1 = ES.S.2	
	Positive Ranks	1 <sup>h</sup>	7.00	7.00	j. ES.O.2 < ES.O.1	
	Ties	1 <sup>i</sup>			k. ES.O.2 > ES.O.1	
	Totals	8			l. ES.O.1 = ES.O.2	
ES.O.2 – ES.O.1	Negative Ranks	7 <sup>j</sup>	4.29	30.00	m. NO.S.2 < NO.S.1	
	Positive Ranks	1 <sup>k</sup>	6.00	6.00	n. NO.S.2 > NO.S.1	
	Ties	0 <sup>l</sup>			o. NO.S.1 = NO.S.2	
	Totals	8			p. NO.O.2 < NO.O.1	
NO.S.2 – NO.S.1	Negative Ranks	6 <sup>m</sup>	6.08	36.50	q. NO.O.2 > NO.O.1	
	Positive Ranks	8 <sup>n</sup>	8.56	68.50	r. NO.O.1 = NO.O.2	
	Ties	2 <sup>o</sup>				
	Totals	16				
NO.O.2 – NO.O.1	Negative Ranks	5 <sup>p</sup>	8.70	43.50		
	Positive Ranks	9 <sup>q</sup>	6.83	61.50		
	Ties	2 <sup>r</sup>				
	Totals	16				
	SE.S.2 – SE.S.1	SE.O.2 – SE.O.1	ES.S.2 – ES.S.1	ES.O.2 – ES.O.1	ES.O.2 – ES.O.1	ES.O.2 – ES.O.1
Z	-1.963 <sup>a</sup>	-2.214 <sup>a</sup>	-1.194 <sup>b</sup>	-1.693 <sup>b</sup>	-1.010 <sup>a</sup>	-.568 <sup>a</sup>
Asymp. Sig. (2-tailed)	.050	.027	.233	.090	.313	.570

a. Based on negative ranks  
b. Based on positive ranks

**Table 37: Summary for the ANOVAs in Experiment 7 across participants**

Source	SS	df	MS	F	Sig.
SENT	85.562	1	85.562	13.884	.002
error	92.437	15	6.162		
ANTE	20.167	1	20.167	2.567	.130
error	117.833	15	7.856		
SENT*ANTE	5.062	1	5.062	.442	.516
error	171.937	15	11.462		

**Table 38: Summary for the ANOVAs in Experiment 7 across items**

Source	SS	df	MS	F	Sig.
ANTE	10.764	1	10.764	1.544	.224
SENT*ANTE	4.035	2	2.018	.289	.751
error	202.180	29	6.972		

Source	SS	df	MS	F	Sig.
intercept	20.664	1	20.664	1.581	.219
SENT	205.035	2	102.518	7.846	.002
error	378.930	29	13.067		

**Table 39: Plausibility pretest results for *correct* version of the texts in Experiment 8**

Text	SE verb <i>because</i> Stimulus		<i>because</i> Experiencer		ES verb <i>because</i> Stimulus		<i>because</i> Experiencer	
	Sub.	Non-Sub.	Sub.	Non-Sub.	Sub.	Non-Sub.	Sub.	Non-Sub.
1	6.75	6.50	6.75	5.00	6.25	6.50	6.75	5.75
2	6.75	5.00	6.50	6.50	6.25	6.50	6.00	6.00
3	6.75	6.50	6.25	5.25	7.00	6.50	6.25	6.00
4	7.00	5.50	6.25	5.75	6.50	6.25	6.75	6.00
5	6.00	6.50	5.75	6.75	6.00	7.00	6.25	6.25
6	6.25	6.75	6.00	4.75	5.50	6.25	4.75	6.25
7	6.50	7.00	5.50	6.25	6.50	7.00	5.50	2.50
8	6.50	6.75	5.00	5.50	6.25	7.00	5.75	6.50
9	5.75	4.75	6.75	6.00	6.75	6.00	6.25	5.75
10	5.50	6.00	5.25	6.25	6.75	6.25	6.75	6.25
11	6.50	5.50	6.25	6.50	5.00	5.75	7.00	6.75
12	6.50	5.50	7.00	6.75	5.50	5.50	6.75	6.25
13	6.50	7.00	6.25	6.50	5.75	6.25	6.00	6.75
14	6.50	6.75	5.75	6.75	4.75	6.75	6.75	6.50
15	6.25	6.25	6.50	6.25	6.00	6.00	6.50	6.50
16	5.75	6.25	5.75	7.00	6.75	6.50	6.50	7.00
Mean	6.359	6.156	6.094	6.109	6.094	6.375	6.281	6.063

**Table 40: Plausibility pretest results for *incorrect* version of the texts in Experiment 8**

Text	SE verb <i>because</i> Stimulus		<i>because</i> Experiencer		ES verb <i>because</i> Stimulus		<i>because</i> Experiencer	
	Sub.	Non-Sub.	Sub.	Non-Sub.	Sub.	Non-Sub.	Sub.	Non-Sub.
1	3.00	1.50	2.75	3.00	2.00	2.00	2.25	3.25
2	2.50	2.50	3.00	2.75	2.75	1.25	1.75	2.25
3	2.25	2.50	1.75	3.25	2.00	3.75	1.75	2.50
4	3.00	1.75	3.25	3.75	2.00	3.75	2.00	3.25
5	1.25	2.00	2.00	3.00	1.50	2.50	2.50	2.25
6	1.00	1.25	3.75	1.75	1.00	3.25	2.25	2.00
7	1.75	1.75	3.75	2.75	2.25	1.50	3.00	2.00
8	1.75	3.00	2.50	1.75	4.00	5.00	3.25	3.50
9	1.25	3.25	1.00	1.75	2.00	1.75	4.25	1.75
10	2.25	3.00	2.25	1.00	4.00	2.75	2.25	2.50
11	2.00	2.50	1.25	3.5	1.25	2.25	3.00	3.25
12	2.00	3.00	2.25	1.75	3.00	2.25	3.25	2.25
13	2.75	1.50	1.50	1.50	2.50	3.25	3.25	4.00
14	3.50	1.75	1.50	2.25	1.75	3.25	1.25	2.25
15	2.75	1.75	2.25	2.50	2.00	2.00	2.25	1.75
16	1.75	1.25	2.00	2.50	2.50	2.25	2.25	2.25
Mean	2.178	2.141	2.297	2.422	2.281	2.672	2.531	2.563



**Table 41: Summary for the ANOVAs in Experiment 8 across participants**

Source	SS	df	MS	F	Sig.
ROLE	46274.524	1	46274.524	.281	.598
error	10374211.070	63	164670.017		
SUBOR	4073282.336	1	4073282.336	21.049	.000
error	12191653.382	63	193518.308		
ANTE	3918687.610	1	3918687.610	17.853	.000
error	13828528.234	63	219500.448		
ROLE*SUBOR	787943.965	1	787943.965	3.297	.074
error	15057066.003	63	239001.048		
ROLE*ANTE	86047.668	1	86047.668	.422	.518
error	12837916.925	63	203776.459		
SUBOR*ANTE	542263.489	1	542263.489	2.587	.113
error	13207499.980	63	209642.857		
SENT*SUBOR*ANTE	43267381.020	1	43267381.020	36.179	.000
error	75342613.699	63	1195914.503		

**Table 42: Summary for the ANOVAs in Experiment 8 across items**

Source	SS	df	MS	F	Sig.
SUBOR	933831.945	1	933831.945	17.626	.000
SUBOR*ROLE	204600.049	1	204600.049	3.862	.059
error	1589367.975	30	52978.932		
ANTE	982889.627	1	982889.627	9.411	.005
ANTE*ROLE	14749.031	1	14749.031	.141	.710
error	3133357.248	30	104445.242		
SUBOR*ANTE	139491.018	1	139491.018	2.717	.110
SUBOR*ANTE*ROLE	9740042.820	1	9740042.820	189.718	.000
error	1540190.881	30	51339.696		

Source	SS	df	MS	F	Sig.
intercept	53448686.281	1	53448686.281	3792.466	.000
ROLE	34469.533	1	34469.533	.245	.625
error	4228037.967	30	140934.599		

**Table 43: Summary for the t-tests in Experiment 9 across participants**

Test Value = 4					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
GS1	9.241	15	.000	6.8125	5.2412	8.3838
GS2	-.810	15	.430	-.4375	-1.5881	.7131
GS3	-8.777	15	.000	-2.8750	-3.5732	-2.1768
SG1	10.425	15	.000	5.6875	4.5246	6.8504
SG2	-1.567	15	.138	-.7500	-1.7704	.2704
SG3	-5.222	15	.000	-2.1250	-2.9924	-1.2576

**Table 44: Summary for the t-tests in Experiment 9 across items**

Test Value = 2					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
GS1	12.169	31	.000	3.4063	2.8354	3.9771
GS2	-1.045	31	.304	-.2188	-.6457	.2082
GS3	-9.680	31	.000	-1.4375	-1.7404	-1.1346
SG1	8.455	31	.000	2.8438	2.1578	3.5297
SG2	-1.679	31	.103	-.3750	-.8306	8.059E-02
SG3	-6.579	31	.000	-1.0625	-1.3919	-.7331

**Table 45: Summary for the t-tests in Experiment 10 across participants**

Test Value = 2						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-.250	31	.804	-6.2500E-02	-.5719	.4469
GS2	11.587	31	.000	3.0938	2.5492	3.6383
GS3	-11.640	31	.000	-1.5625	-1.8363	-1.2887
SG1	-4.587	31	.000	-9.063	-1.3092	-.5033
SG2	12.758	31	.000	3.3125	2.7830	3.8420
SG3	-7.924	31	.000	-1.2188	-1.5325	-.9050

**Table 46: Summary for the t-tests in Experiment 10 across items**

Test Value = 4						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	3.890	15	.001	1.8750	.8477	2.9023
GS2	13.970	15	.000	8.1875	6.9383	9.4367
GS3	-6.260	15	.000	-1.1250	-1.5080	-.7420
SG1	.446	15	.662	.1875	-.7088	1.0838
SG2	14.601	15	.000	8.6250	7.3659	9.8841
SG3	-1.199	15	.249	-.4375	-1.2150	.3400

**Table 47: Summary for the t-tests in Experiment 11 across participants**

Test Value = 2						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-1.543	31	.133	-.3438	-.7980	.1105
GS2	-4.176	31	.000	-.7500	-1.1163	-.3837
GS3	8.920	31	.000	2.5625	1.9766	3.1484
SG1	-7.973	31	.000	-1.3750	-1.7267	-1.0233
SG2	-5.075	31	.000	-1.0313	-1.4457	-.6.68
SG3	16.609	31	.000	4.3125	3.7830	4.8420

**Table 48: Summary for the t-tests in Experiment 11 across items**

Test Value = 4						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-1.696	15	.111	-.6875	-1.5515	.1765
GS2	-3.105	15	.007	-1.5000	-2.5296	-.4704
GS3	6.445	15	.000	5.1250	3.4301	6.8199
SG1	-8.521	15	.000	-2.7500	-3.4379	-2.0621
SG2	-5.567	15	.000	-2.0625	-2.8521	-1.2729
SG3	15.999	15	.000	8.6250	7.4759	9.7741

**Table 49: Summary for the t-tests in Experiment 12 across participants**

Test Value = 2						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-.259	31	.798	-6.2500E-02	-.5551	.4301
GS2	8.508	31	.000	2.2188	1.6869	2.7506
GS3	-5.203	31	.000	-1.0313	-1.4355	-.6270
SG1	-1.539	31	.134	-.3125	-.7265	.1015
SG2	10.339	31	.000	2.5000	2.0068	2.9932
SG3	-6.106	31	.000	-.9688	-1.2923	-.6452

**Table 50: Summary for the t-tests in Experiment 12 across items**

Test Value = 4						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-.232	15	.820	-.1250	-1.2741	1.0241
GS2	4.814	15	.000	4.4375	2.4727	6.4023
GS3	-3.279	15	.005	-2.0625	-3.4031	-.7219
SG1	-.979	15	.343	-.6250	-1.9853	.7353
SG2	5.130	15	.000	5.0000	2.9225	7.0775
SG3	-4.291	15	.001	-1.9375	-2.9000	-.9750

**Table 51: Summary for the t-tests in Experiment 13 across participants**

Test Value = 2						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-4.574	31	.000	-1.0938	-1.5814	-.6061
GS2	4.336	31	.000	1.3125	.6952	1.9298
GS3	4.117	31	.000	1.4063	.7097	2.1028
SG1	-17.181	31	.000	-1.6563	-1.8529	-1.4596
SG2	2.925	31	.000	.9375	.2839	1.5911
SG3	5.334	31	.000	1.9063	1.1773	2.6352

**Table 52: Summary for the t-tests in Experiment 13 across items**

Test Value = 4						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-5.614	15	.000	-2.1875	-3.0180	-1.3570
GS2	4.072	15	.001	2.6250	1.2509	3.9991
GS3	5.428	15	.000	2.8125	1.7081	3.9169
SG1	-15.174	15	.000	-3.3125	-3.7778	-2.8472
SG2	3.758	15	.002	1.8750	.8115	2.9385
SG3	6.014	15	.000	3.8125	2.4614	5.1636

**Table 53: Summary for the t-tests in Experiment 14 across participants**

Test Value = 2					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
GS1	.220	31	.827	6.250E-02	-.5162	.6412
GS2	-1.438	31	.161	-.3125	-.7558	.1308
GS3	5.029	31	.000	1.5313	.9103	2.1522
SG1	-6.500	31	.000	-1.0313	-1.3548	-.7077
SG2	3.571	31	.001	.7813	.3351	1.2274
SG3	5.104	31	.000	1.7188	1.0320	2.4055

**Table 54: Summary for the t-tests in Experiment 14 across items**

Test Value = 4					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
GS1	.185	15	.856	.1250	-1.3164	1.5664
GS2	-1.373	15	.190	-.6250	-1.5954	.3454
GS3	4.464	15	.000	3.0625	1.6004	4.5246
SG1	-5.567	15	.000	-2.0625	-2.8521	-1.2729
SG2	2.581	15	.021	1.5625	.2723	2.8527
SG3	6.111	15	.000	3.4375	2.2386	4.6364

**Table 55: Summary for the t-tests in Experiment 15 across participants**

Test Value = 2					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
GS1	1.321	31	.196	.3438	-.1872	.8747
GS2	3.937	31	.000	1.2500	.6025	1.8975
GS3	-3.788	31	.001	-.5625	-.8654	-.2596
SG1	-7.563	31	.000	-1.2813	-1.6268	-.9357
SG2	4.431	31	.000	1.3438	.7253	1.9622
SG3	3.059	31	.005	1.0000	.3333	1.6667

**Table 56: Summary for the t-tests in Experiment 15 across items**

Test Value = 4					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
GS1	.843	15	.412	.6875	-1.0498	2.4248
GS2	2.855	15	.012	2.5000	.6337	4.3663
GS3	-1.388	15	.186	-1.1250	-2.8530	.6030
SG1	-7.255	15	.000	-2.5625	-3.3153	-1.8097
SG2	3.009	15	.009	2.6875	.7839	4.5911
SG3	2.169	15	.047	2.000	3.490E-02	3.9651

Table 57: Summary for the t-tests in Experiment 16 across participants

Test Value = 2.67						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS2	18.114	31	.000	3.7050	3.2878	4.1222
GS3	-20.371	31	.000	-2.4200	-2.6623	-2.1777
SG2	14.223	31	.000	3.1113	2.6651	3.5574
SG3	-10.073	31	.000	-1.7950	-2.1584	-1.4316

Table 58: Summary for the t-tests in Experiment 16 across items

Test Value = 5.34						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS2	11.098	15	.000	7.4100	5.9868	8.8332
GS3	-30.611	15	.000	-4.8400	-5.1770	-4.5030
SG2	7.395	15	.000	6.2225	4.4289	8.0161
SG3	-9.989	15	.000	-3.5900	-4.3560	-2.8240

Table 59: Summary for the t-tests in Experiment 17 across participants

Test Value = 2.67						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	5.260	31	.000	2.0488	1.2544	2.8431
GS3	-14.586	31	.000	-2.0450	-2.3309	-1.7591
SG1	3.076	31	.004	1.1425	.3849	1.9001
SG3	-5.555	31	.000	-1.1700	-1.5995	-.7405

Table 60: Summary for the t-tests in Experiment 17 across items

Test Value = 5.34						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	10.045	15	.000	4.0975	3.2280	4.9670
GS3	-15.368	15	.000	-4.0900	-4.6573	-3.5227
SG1	4.301	15	.001	2.2850	1.1525	3.4175
SG3	-4.680	15	.000	-2.3400	-3.4057	-1.2743

**Table 61: Summary for the t-tests in Experiment 18 across participants**

Test Value = 2.67						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-6.916	31	.000	-1.5450	-2.0006	-1.0894
GS2	12.434	31	.000	2.9863	2.4964	3.4761
SG1	-7.727	31	.000	-1.7325	-2.1898	-1.2752
SG2	11.774	31	.000	2.8925	2.3914	3.3936

**Table 62: Summary for the t-tests in Experiment 18 across items**

Test Value = 5.34						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
GS1	-7.665	15	.000	-3.0900	-3.9492	-2.2308
GS2	8.538	15	.000	5.9725	4.4815	7.4635
SG1	-8.978	15	.000	-3.4650	-4.2876	-2.6424
SG2	7.228	15	.000	5.7850	4.0790	7.4910

**Table 63: Summary for the ANOVAs in Experiment 19a across participants**

Source	SS	df	MS	F	sig.
PARA	5145525.141	1	5145525.141	8.551	.006
error	18653573.359	31	601728.173		
SUBJ	74064.063	1	74064.063	2.469	.126
error	9366479.937	31	302144.514		
NSUBJ	1202312.250	1	1202312.250	3.196	.084
error	11660755.750	31	376153.411		
PARA*SUBJ	10860320.250	1	10860320.250	21.153	.000
error	15916042.750	31	513420.734		
PARA*NSUBJ	1815082.562	1	1815082.562	5.578	.025
error	10086730.437	31	325378.401		
SUBJ*NSUBJ	1336625.016	1	1336625.016	3.184	.084
error	13013728.484	31	419797.693		
PARA*SUBJ*NSUBJ	33718.141	1	33718.141	.119	.732
error	8762224.359	31	282652.399		

**Table 64: Summary for the ANOVAs in Experiment 19a across items**

Source	SS	df	MS	F	sig.
PARA	2572762.570	1	2572762.570	11.993	.003
error	3217809.555	15	214520.637		
SUBJ	372924.070	1	372924.070	1.020	.329
error	5484208.055	15	365613.870		
NSUBJ	600197.070	1	600197.070	3.781	.071
error	2381259.555	15	158750.637		
PARA*SUBJ	5428100.633	1	5428100.633	21.772	.000
error	3739817.492	15	249321.166		
PARA*NSUBJ	907036.133	1	907036.133	7.476	.015
error	1819940.492	15	121329.366		
SUBJ*NSUBJ	668023.508	1	668023.508	4.239	.057
error	2364061.117	15	157604.074		
PARA*SUBJ*NSUBJ	16951.008	1	16951.008	.177	.680
error	1435383.617	15	95692.241		

**Table 65: Summary for the ANOVAs in Experiment 19b across participants**

Source	SS	df	MS	F	sig.
PARA	18157.563	1	18157.563	.071	.792
error	7977181.437	31	27328.433		
SUBJ	1088370.562	1	1088370.562	1.536	.225
error	2169911.937	31	708706.837		
NSUBJ	5445805.641	1	5445805.641	13.772	.001
error	12258252.859	31	395427.512		
PARA*SUBJ	3244951.891	1	3244951.891	4.956	.033
error	20295971.609	31	654708.762		
PARA*NSUBJ	197136.000	1	197136.000	.549	.464
error	11121911.500	31	358771.339		
SUBJ*NSUBJ	3274290.250	1	3274290.250	4.866	.035
error	20857602.750	31	672825.895		
PARA*SUBJ*NSUBJ	2013.766	1	2013.766	.012	.912
error	4998909.234	31	161255.137		

**Table 66: Summary for the ANOVAs in Experiment 19b across items**

Source	SS	df	MS	F	sig.
PARA	1443151.723	1	1443151.723	3.252	.081
error	13756696.152	15	443764.392		
SUBJ	909519.848	1	909519.848	2.824	.103
error	9985281.527	15	322105.856		
NSUBJ	2941439.379	1	2941439.379	12.329	.001
error	7396244.496	15	238588.532		
PARA*SUBJ	6491348.535	1	6491348.535	22.761	.000
error	8841149.340	15	285198.366		
PARA*NSUBJ	204247.504	1	204247.504	.575	.454
error	11013537.871	15	355275.415		
SUBJ*NSUBJ	106806.410	1	106806.410	.356	.555
error	9312210.465	15	300393.886		
PARA*SUBJ*NSUBJ	13067.348	1	13067.348	.037	.849
error	11042965.027	15	356224.678		

Table 67: Summary for the ANOVAs on reading times in Experiment 20a across participants

Source	SS	df	MS	F	sig.
PARA	1951155.931	1	1951155.931	3.678	.065
error	14852294.319	31	530439.083		
SUBJ	3524210.500	1	3524210.500	10.466	.003
error	9428589.750	31	336735.348		
NSUBJ	2546053.517	1	2546053.517	13.050	.001
error	5462982.733	31	195106.526		
PARA*SUBJ	1587972.569	1	1587972.569	4.870	.036
error	9130285.181	31	326081.614		
PARA*NSUBJ	510234.483	1	510234.483	1.858	.184
error	7689396.267	31	274621.295		
SUBJ*NSUBJ	172929.121	1	172929.121	.740	.397
error	6539213.629	31	233543.344		
PARA*SUBJ*NSUBJ	4122.776	1	4122.776	.019	.890
error	5933003.474	31	211892.981		

Table 68: Summary for the ANOVAs on reading times in Experiment 20a across items

Source	SS	df	MS	F	sig.
PARA	459421.875	1	459421.875	1.118	.308
error	5754574.250	15	411041.018		
SUBJ	2167872.008	1	2167872.008	21.977	.000
error	1381005.617	15	98643.258		
NSUBJ	370629.675	1	370629.675	2.057	.174
error	2522956.450	15	180211.175		
PARA*SUBJ	798864.008	1	798864.008	1.846	.196
error	6057659.117	15	432689.937		
PARA*NSUBJ	118126.875	1	118126.875	.341	.568
error	4843765.750	15	345983.268		
SUBJ*NSUBJ	70325.208	1	70325.208	.366	.555
error	2692075.917	15	192291.137		
PARA*SUBJ*NSUBJ	155016.408	1	155016.408	.506	.489
error	4289312.217	15	306379.444		



**Table 69: Summary for the ANOVAs on reading times in Experiment 20b across participants**

Source	SS	df	MS	F	sig.
PARA	2530662.862	1	2530662.862	4.914	.035
error	13905872.763	31	515032.325		
SUBJ	668063.790	1	668063.790	2.857	.102
error	6312923.835	31	233811.994		
NSUBJ	7982992.719	1	7982992.719	15.950	.000
error	13513895.406	31	500514.645		
PARA*SUBJ	5755218.862	1	5755218.862	8.483	.007
error	18317637.763	31	678431.028		
PARA*NSUBJ	7837.612	1	7837.612	.020	.889
error	10712929.513	31	396775.167		
SUBJ*NSUBJ	56801.209	1	56801.209	.147	.704
error	10432402.835	31	386385.290		
PARA*SUBJ*NSUBJ	164540.362	1	164540.362	.524	.475
error	8481112.763	31	314115.288		

**Table 70: Summary for the ANOVAs on reading times in Experiment 20b across items**

Source	SS	df	MS	F	sig.
PARA	1851369.031	1	1851369.031	5.123	.039
error	5420804.469	15	361386.965		
SUBJ	579157.031	1	579157.031	.871	.365
error	9975225.969	15	665015.065		
NSUBJ	4294647.781	1	4294647.781	6.539	.022
error	9851853.719	15	656790.248		
PARA*SUBJ	4503750.781	1	4503750.781	11.886	.004
error	5683697.719	15	378913.181		
PARA*NSUBJ	80300.281	1	80300.281	.238	.633
error	5062090.719	15	337472.715		
SUBJ*NSUBJ	18384.031	1	18384.031	.056	.816
error	4942865.469	15	329524.365		
PARA*SUBJ*NSUBJ	77126.281	1	77126.281	.255	.621
error	4529320.719	15	301954.715		

**Table 71: Summary for the ANOVAs on acceptability judgements in Experiment 20a across participants**

Source	SS	df	MS	F	sig.
PARA	.204	1	.204	2.027	.165
error	2.921	29	.101		
SUBJ	.337	1	.337	1.691	.204
error	5.787	29	.200		
NSUBJ	.104	1	.104	1.495	.231
error	2.021	29	6.968E-02		
PARA*SUBJ	.504	1	.504	3.548	.070
error	4.121	29	.142		
PARA*NSUBJ	.504	1	.504	3.548	.070
error	4.121	29	.142		
SUBJ*NSUBJ	.104	1	.104	1.198	.283
error	2.521	29	8.693E-02		
PARA*SUBJ*NSUBJ	.104	1	.104	.751	.393
error	4.021	29	.139		

**Table 72: Summary for the ANOVAs on acceptability judgements in Experiment 20a across items**

Source	SS	df	MS	F	sig.
PARA	.945	1	.945	1.634	.221
error	8.680	15	.579		
SUBJ	.945	1	.945	3.030	.102
error	4.680	15	.312		
NSUBJ	.195	1	.195	.661	.426
error	4.430	15	.295		
PARA*SUBJ	2.258	1	2.258	8.758	.010
error	3.867	15	.258		
PARA*NSUBJ	1.758	1	1.758	7.831	.014
error	3.367	15	.224		
SUBJ*NSUBJ	.383	1	.383	1.534	.234
error	3.742	15	.249		
PARA*SUBJ*NSUBJ	.383	1	.383	1.095	.312
error	5.242	15	.349		

**Table 73: Summary for the ANOVAs on acceptability judgements in Experiment 20b across participants**

Source	SS	df	MS	F	sig.
PARA	.938	1	.938	8.529	.007
error	3.187	29	.110		
SUBJ	.504	1	.504	2.389	.133
error	6.121	29	.211		
NSUBJ	.938	1	.938	6.493	.016
error	4.187	29	.144		
PARA*SUBJ	.104	1	.104	.547	.465
error	5.521	29	.190		
PARA*NSUBJ	.104	1	.104	1.000	.326
error	3.021	29	.104		
SUBJ*NSUBJ	4.167E-03	1	4.167E-03	.033	.856
error	3.621	29	.125		
PARA*SUBJ*NSUBJ	.104	1	.104	.858	.362
error	3.521	29	.121		

**Table 74: Summary for the ANOVAs on acceptability judgements in Experiment 20b across items**

Source	SS	df	MS	F	sig.
PARA	2.000	1	2.000	1.875	.191
error	16.000	15	1.067		
SUBJ	1.531	1	1.531	3.551	.079
error	6.469	15	.431		
NSUBJ	2.000	1	2.000	4.615	.048
error	6.500	15	.433		
PARA*SUBJ	.500	1	.500	2.143	.164
error	3.500	15	.233		
PARA*NSUBJ	3.125E-02	1	3.125E-02	.086	.774
error	5.469	15	.365		
SUBJ*NSUBJ	.000	1	.000	.000	1.000
error	5.500	15	.367		
PARA*SUBJ*NSUBJ	3.125E-02	1	3.125E-02	.135	.718
error	3.469	15	.231		

Table 75: Summary for the ANOVAs in Experiment 21a across participants

Source	SS	df	MS	F	sig.
PARA	2653742.813	1	2653742.813	6.091	.019
error	13505179.718	31	435650.959		
SUBJ	362592.149	1	362592.149	.643	.429
error	17475079.007	31	563712.226		
NSUBJ	5723308.618	1	5723308.618	11.405	.002
error	15556747.163	31	501830.554		
PARA*SUBJ	1026105.688	1	1026105.688	.823	.371
error	38661060.843	31	1247130.995		
PARA*NSUBJ	2657816.954	1	2657816.954	4.812	.036
error	17120568.452	31	552276.402		
SUBJ*NSUBJ	5139997.462	1	5139997.462	8.045	.008
error	19807300.319	31	638945.172		
PARA*SUBJ*NSUBJ	402233.423	1	402233.423	.927	.343
error	13443959.233	31	433676.104		

Table 76: Summary for the ANOVAs in Experiment 21a across items

Source	SS	df	MS	F	sig.
PARA	708719.533	1	708719.533	1.887	.190
error	5634580.436	15	375638.696		
SUBJ	349500.252	1	349500.252	.637	.437
error	8232088.092	15	548805.873		
NSUBJ	2659250.393	1	2659250.393	4.509	.051
error	8847195.576	15	589813.038		
PARA*SUBJ	684084.424	1	684084.424	1.922	.186
error	5337669.295	15	355844.620		
PARA*NSUBJ	1007223.986	1	1007223.986	2.572	.130
error	5873346.607	15	391556.440		
SUBJ*NSUBJ	1588764.533	1	1588764.533	4.832	.044
error	4931698.436	15	328779.896		
PARA*SUBJ*NSUBJ	262042.752	1	262042.752	.443	.516
error	8869521.842	15	591301.456		

**Table 77: Summary for the ANOVAs in Experiment 21b across participants**

Source	SS	df	MS	F	sig.
PARA	9545975.743	1	9545975.743	15.411	.000
error	19201842.288	31	619414.267		
SUBJ	72109.032	1	72109.032	.085	.773
error	26307576.374	31	848631.496		
NSUBJ	1841194.571	1	1841194.571	3.256	.081
error	17527556.710	31	565405.055		
PARA*SUBJ	7024984.595	1	7024984.595	10.508	.003
error	20724200.812	31	668522.607		
PARA*NSUBJ	65488.009	1	65488.009	.226	.638
error	8979077.022	31	289647.646		
SUBJ*NSUBJ	107153.931	1	107153.931	.193	.663
error	17170207.976	31	553877.677		
PARA*SUBJ*NSUBJ	33592.017	1	33592.017	.098	.756
error	10634232.390	31	343039.755		

**Table 78: Summary for the ANOVAs in Experiment 21b across items**

Source	SS	df	MS	F	sig.
PARA	6403725.781	1	6403725.781	12.984	.003
error	7398004.969	15	493200.331		
SUBJ	91.125	1	91.125	.000	.988
error	6225757.500	15	415050.500		
NSUBJ	559417.531	1	559417.531	1.931	.185
error	4344966.219	15	289664.415		
PARA*SUBJ	4226414.695	1	4226414.695	4.680	.047
error	13547522.930	15	903168.195		
PARA*NSUBJ	31156.320	1	31156.320	.090	.768
error	5182674.180	15	345511.612		
SUBJ*NSUBJ	115260.008	1	115260.008	.476	.501
error	3630013.117	15	242000.874		
PARA*SUBJ*NSUBJ	19552.531	1	19552.531	.083	.777
error	3516959.594	15	234463.973		

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